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Book Reviews

The Council for Social and Economic Studies

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The Journal of SOCIAL, POLITICAL AND ECONOMIC STUDIES

Roger Pearson
General Editor
Dwight D. Murphey
Associate Editor

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Tapping the Wealth of the Moon

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With the renewed attention to **Space Exploration and the role of humans in Space** questions of the uses of the Moon and other bodies of the Solar system have come to the forefront: is human Space flight but a romantic quest of childhood dreams or are there key opportunities to be opened and explored for the benefit of mankind – on Earth or in Space?

Economic laws – which apply in Space as well as on Earth – will limit beneficial uses of Space for Earth to the immediate vicinity of Earth in the solar system, the Moon. These 'constraints' will limit the uses for Earth to essentially observations, communications and energy – all **commodities with 'low mass' and 'speed of light'** transmission.

The revolutionary concept of a **'condominium' of observation facilities** is proposed for observations of the universe, the Sun and the Earth – providing a stable, nearly limitless aperture across the electromagnetic spectrum with huge advantages in reliability, costs and assurance of continuity of observations. Similarly, **communications, navigation, command and control of civil and scientific activities** on the Moon and for Cis- and Translunar space will change fundamentally.

Beyond these uses, the 'tapping' of the vast Solar **energy resources** available on the Moon promises fundamental changes in Space operations, Space transportation and potentially clean energy supplies across all regions of Earth. E.g. with 1 GWe supply on the Moon a new age of **'fuel-less' space transportation** across Cis- and Translunar space is enabled, ultimately allowing speeds of up to one third the speed of light for missions to nearby solar systems.

Last and not least, with such assured energy supplies, all the **lunar resources** can be tapped for the establishment of Closed Ecological Life Support Systems (CELSS) leading to the **first settlement independent of Earth** – a most historic step for mankind to assuring its survival and expansion into Space.

Key Words: Space observations; Space communications; Space transportation; Energy supplies; Lunar resources; Fuel-less transportation; Space operations; Closed ecological life support systems; Space power; Space asset management; Space enterprise; Space exploration; Humans in Space; Assurance of survival.

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A. The Centrality of the Moon as the next Major Milestone in Human Space Exploration

With the Columbia Disaster once more basic questions as to the purpose and scope of US space enterprise were raised and had to be answered. At the core of this enterprise has been and remains the human exploration of Space so much at the core of US/NASA activities since the very inception of the US space program.

On January 14, 2004 the President announced a renewed Space Initiative, setting out firm goals for NASA to accomplish over a certain time period. At the core of that initiative is item three of the White House Fact sheet released as part of this initiative (see quote below). In respect of this decision some stringent economic and programmatic considerations can be advanced to lend strong bi-partisan support to this renewed invigoration of human space flight for the decades ahead. What are the economic and programmatic criteria that might be advanced in support of and as a basis for this renewed national commitment? (see Figure 1) Can an economic case be made for the Moon on strictly economic grounds?

That is the challenge which is addressed in this paper.

President Bush Statement on New Space Initiative:

> "America will return to the Moon as early as 2015 and no later than 2020 and use it as a stepping stone for more ambitious missions. A series of robotic missions to the Moon, similar to the Spirit Rover that is sending remarkable images back to Earth from Mars, will explore the lunar surface beginning no later than 2008 to research and **prepare for future human exploration**. Using the Crew Exploration Vehicle, humans will conduct **extended** lunar missions as early as 2015, **with the goal of living and working there for increasingly extended periods.**
>
> - **The extended human presence on the Moon** will enable astronauts to develop new technologies and **harness the Moon's abundant resources** to allow manned exploration of more challenging environments. An extended human presence on the Moon could **reduce the costs of further exploration**, since lunar-based spacecraft could escape the

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Moon's lower gravity using less energy at less cost than Earth-based vehicles. The experience and knowledge gained on the Moon will serve as a **foundation for human missions beyond the Moon**, beginning with Mars.

- NASA will increase the use of **robotic exploration** to maximize our understanding of the **solar system** and pave the way for more ambitious manned missions. Probes, landers, and similar unmanned vehicles will serve as trailblazers and send vast amounts of knowledge back to scientists on Earth." **[emphasis added]**

B. The Four Universal Laws (Constraints) of Economics
(Valid even in 'Parallel' Universes – with or without 'Inflation')

In 1972 and then again in 1986 at the IAA-IAF meetings the author set forth basic economic considerations applicable to Space Enterprise, with very dire (constraining) implications as to the type and scope of economic activities and returns from Space enterprise – leaving aside for the moment the sophomoric 'spin-off' arguments, important as these might be to the layman. (See Appendix).

Whereas the laws of physics at various phases of cosmological developments may or may not apply, mutate, or change to make observations meet the desired beginnings or outcomes, these laws of economics are immutable and apply universally, with possibly still unexplored applications to the physical sciences. These are:

1 – The Cost of Time (Interest, "i"):

This cost is larger than or equal to zero (i.e. can never be negative in real terms) and is an incredible "*value crunching machine*": so much so that the economist Heilbronner published in the 1970s a provocative article titled "The world ends in 200 years: so what!" One can easily agree with his conclusions by the simple thought experiment of how wrong such Doomsday Sayers in whatever cloth – particularly that of 'scientists' – would have been with such fears say in 1804. This is particularly true in the consumer societies of today where practically anything that extends beyond a decade is outside the interest span of most. Heilbronner's point, of course, was that anything we 'predict' today for 200 years hence is simply beyond the rational scope of public

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policy concerns if only for an inability to anticipate technological, societal and, yes, climatic change.

2 – The Cost of Transport ("delta V"):

Overcoming gravity to move mass from its source to its desired destination is subject to the requisite force to transport such mass.

3 – The Price of Commodities (Goods and Services, "p") as a Function of Supply and Demand:

Whereas commodities in scarce supply and high demand carry high prices, most of these prices collapse radically when their supply increases unexpectedly. Historically the most stable price was that of gold to silver (1:12) over many millennia until the discovery of the Americas whence that price collapsed because of 'oversupply' of silver. A telling example: were one to discover and capture an asteroid made up entirely of perfectly cut 10 karat diamonds, the price of diamonds would rapidly approach zero as it came closer to landing at Cape Canaveral.

4 – Location as a Function of the above Three Factors (Cost of Time, Transport and Price):

The constraints imposed by items 1 through 3 above will severely restrict rational policy choices.

C. Applying these Economic Laws to Space Enterprise:

Literally hundreds if not thousands of scientists and engineers have done impressive work on the feasibility and scope of Lunar activities needed to establish a first presence of humans on the Moon. Many were documented in 1985 in "*Lunar Bases and Space Activities in the 21st Century*", edited by W.W. Mendell. We do not start with a 'blank page'.

One of the most imaginative – and at some future time realistic – works on the role and scope of the Moon in mankind's future has been described by Krafft Ehricke, in papers dating to the late 1960s and early 1970s and summarized in "*Lunar Industrialization and Settlement – Birth of a Polyglobal Civilization*[2]." The Moon can be an integral part of the Cis-Lunar and planetary economy. The question is, "How do we get

[2] Mendell, W.W. Editor, *Lunar Bases and Space Activities of the 21st Century,* Lunar and Planetary Institute, Houston, Texas, 1985; see also the *Partial Bibliography* in Appendix E.

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from here to 'there'".

Most of the major Space policy assessments and exercises of the past sixty years are unidirectional, with the Moon as a stepping-stone to other places in the Solar system. Among the large mass of articles, papers, and writings only a few deal with the beneficial uses of the Moon for Cis-Lunar Space and, even fewer with significant direct benefits that could be derived from investments and operations on and from the Moon.

Indeed, many space experts are astonished at having 'missed' this inward looking perspective for Space exploration from the Moon. "Thinking within the Cis-Lunar box," while everybody has been scrambling to move and think outside that box, requires in this sense a reversal of paradigms.

Transportation costs and the **cost of time** (interest) will limit the 'economic' uses of Space. Because of transportation and interest costs, the commodities (goods and services) delivered from Space to Earth will need to have near zero mass and travel close to the speed of light. In addition, if one allows for the 'demand-price' relationship, then the price of such physical goods would collapse with a large supply from Space.

These 'iron laws' of economics combine to 'limit' commodities for use on Earth to essentially data and energy. **'Data'** in the form of **observations, communications** and location compose the 'information economy' – well over 50% of all economic activities of advanced economies and societies. **"Energy"** is in the form of light (optical) or other forms across the electromagnetic spectrum.

Similarly, the region where these activities will be located will be principally in near-Earth Space. Following the 'location' theory of economic activities based on 'marginal advantages' and 'marginal costs' first described by von Thünen in the 19th century[3], these activities will be limited to near-Earth space at least until communities and settlements independent of Earth are established elsewhere – with the same

[3] Thünen, Johann Heinrich von, *Der Isolierte Staat in Beziehung auf die Landwirtschaft und die Nationalökonomie,* [The Isolated State in Relation to Agriculture and the Economy], Hamburg 1826 and 1850, wherein von Thünen explained the location of various economic activities as a function of transport cost, including the cost of time (interest) based on marginal costs and marginal benefits.

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'economic laws' applying 'there' as well, wherever that may be in the universe.

The enthusiasm of Krafft Ehricke and others for exchanging material supplies and goods between a Lunar and a 'terrestrial' economy is mistaken. Similarly, the idea of physical travel outside the Solar system is beyond reach currently. It is much easier to transmit data and information (as well as DNA – i.e., human genome 'data') than large quantities of 'humans,' mostly in the form of water. (These same 'laws' lead us to transport orange juice concentrate from Florida to other locations, even within the United States.)

The **"Space Economy"** for some time to come will be a **Cis-Lunar economy**, comprising and affecting large parts of the terrestrial **information** sectors first; and later the global **energy** sectors, with in-space energy supplies as the first significant step toward the development of energy supplies in and from Space.

Due to transportation costs (delta-V), economics will favor extensive use of **lunar mineral resources** for in-orbit Cis- and Trans-Lunar applications and projects, leading to possibly 'massive' infrastructures to make use of the information and energy potential of Space – and of the Moon in particular.

D. Assessment Criteria for Determining the Next Major Goal in Human Space Exploration.

So as not to reinvent the wheel, this report draws heavily from the numerous studies by NASA and various commissions to make specific recommendations. The assessment and recommendations elaborated in the following pages were molded by constraints that the U.S. Human Space Flight Program should:

1) *Be accomplished within a decade.* JFK set the example. Anything beyond a decade is outside the attention span (seriousness test) of U.S. political decisions and the horizon of public interest when trading off budget requirements.

2) *Require no substantial increase in the NASA budget.* Obviously a major reorientation of NASA priorities may/should ensue with a major new challenge, but in no case should the goal set require a doubling or more of the current NASA budget.

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3) *Capitalize on past technology achievements and knowledge base.* These include the Apollo program, Space Shuttle and Space Station technologies, propulsion and space operations know-how, and commercial and other infrastructure.

4) *Significantly increase civilian and national security uses of Space for the benefit of the United States.* The opening and control of Cis- and Circumlunar Space for U.S. Space activities would clearly accomplish this.

5) *Be accomplished with manageable risks.* Clearly Human Space Flight for the foreseeable future will involve substantial risk, including the loss of life; but such has been the case for all major milestones in human exploration throughout the ages. Most technology required for Cis- and Circumlunar Space operations is a limited extension of technology demonstrated three decades ago. Still, major uncertainties may affect Human Space Flight for longer durations, such as the effects of micro gravity, cosmic heavy particle radiation and prolonged isolation – all of which are as yet not fully understood or tested.

6) *Make a historic contribution to the expansion of human enterprise.* One such overriding goal has to be to realize an Earth independent technology base for human habitation outside – and ultimately independent of – Earth.

7) *Encourage a new regime for human and economic activities in Space.* To assure the benefits of free enterprise, the legal regime for Space operations should pursue the principle of full sovereignty, including private property and enterprise. Under the current, often undefined, legal and regulatory regime, Lewis and Clark would still be lingering east of the Mississippi.

8) *Conform to the 'iron laws' of the economics for the cost of transportation and the cost of time (interest).* The transport costs of mass ("delta-V" requirements) and the cost of time (interest) are inescapable, increase geometrically with distance from Earth and hence will confine human activities to near-Earth space in the foreseeable future – particularly when

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considered in combination with the uniquely adverse, unknown Space environment effects on astronauts from extended activities in Space.

9) *Stimulate our nation's youth and their enthusiasm for exploration, the sciences and technology.* Whatever the goal, it should be complemented with programs that actively involve students, academia, and local government, i.e. beyond the well-trodden paths of Federal contracting and grants.

10) *Be accomplished as a U.S.-led program.* Other nations will be welcome to pursue programs of their own, conforming to their various priorities and desires, or to join the U.S. effort subject to the criteria outlined herein.

E. Applying these Criteria and Laws:
A Clear and Unambiguous Choice

Three broad options are outlined:

Option I: Abandon Human Space Flight

One of the first papers on Space given by the principal author of this report was titled **"The Fallacies of the Anthropocentric Approach to Space Exploration."** This paper, given at the 1968 IAF meetings in New York[4], argued that, for the same expenditure – or less – the Apollo program then to be completed within a year (in 1969) could have obtained the same sample returns through robotic technologies and extended these capabilities throughout the Solar system. A close reading 'between the lines' of NASA's current long term plan would lead one to similar conclusions.

How right in the abstract theory of the ivory towers of scientists and the world of accountants; how wrong in the quest of human exploration and historic advancement. Here is why. The question is: "Can Man establish a presence in Space – ultimately independent of support from Earth?" This clearly must be seen as an ultimate question of mankind, with profound philosophical, psychological, societal implications.

Much has been said since the Columbia accident – and will be re-

[4] "Fallacies of the Anthropocentric Approach of the U.S. Space Program", Annual Meeting of the International Astronautics Federation Annual Meeting New York, New York, 1968

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peated in future weeks – about the promise and cost of the Space Transportation and of Space Enterprise. It is sad that it takes tragedy to focus our affluent society on the core issues of human enterprise and on the core importance of Space to America's future – in Space and on Earth.

2003 saw the launch to and return from Space of the first astronaut by China, which has a focused, technologically-maturing Space program. Someday America may see a serious challenge from China as a major space power. Hopefully, the Columbia disaster will prompt a renewed U.S. commitment to Human Space Exploration and Enterprise, which will again spur U.S. technological advances that ensure America continues as the world's preeminent Space power.

Underlying all this enthusiasm and active interest by the people world wide in Human Space Enterprise is one overriding **"non-Archimedean"** aspect of the quest for Space: ultimately **the establishment of the first human outpost in Space independent of Earth** to then continue and bring about the expansion of human habitation beyond Earth, throughout the solar system and ultimately beyond. It is possibly an inborn genetic instinct to ask for and to pursue the escape from **'single point failure' that constitutes Earth.** This is, consciously or subconsciously, the most universal motivating force for the enthusiasm – worldwide – of human space flight, exploration and ultimately habitation independent of Earth. It is a goal far transcending any scientific or practical pursuits – and particularly 'robotic scientists' should be appreciative of this basic rational and motivation for Human Space Enterprise.

It may well be that we will find out in the decades ahead that humans were not meant to travel into the solar system and beyond – for whatever reasons and constraints – but as of today all indications are that quite the opposite is the case. We owe it to ourselves and the generations to follow to find an answer to these issues and prospects in the decades ahead.

Option II: Go to Mars and Establish
a Permanent Presence of Humans on Mars

Manned exploration of Mars was an 'obvious' destination for those

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who first considered space travel within the Solar System and beyond. It was considered in a 1609 letter from Johannes Kepler to Galileo Galilei. Human exploration of Mars also was tied to the initial recommendations for post-Apollo manned space exploration – the 1969 Space Task Group Report recommended the full development of LEO[5], permanent manned outposts on the Moon and initial, mostly unmanned, exploration of Mars. NASA Administrator Tom Paine emphasized the long-range objective of manned exploration of Mars – and President Nixon, under growing adverse political and budgetary pressures, rejected this ambitious goal. In 1991, President George H.W. Bush again emphasized the long-term goal of a manned mission to Mars – and NASA's program again floundered. We might again consider a manned mission to Mars as the next goal for U.S. Space enterprise.

This long-term goal, though desirable, may be too ambitious to sustain the needed political support – e.g., it fails the first criteria of being achievable within a decade. Serious obstacles and uncertainties must be resolved before commitment to such an enterprise is viable. Critical challenges to traveling to Mars within a decade, include:

- The effects of solar and cosmic radiation, **heavy particle (HZE) radiation** in particular, on the human body during prolonged Space flight. They are ubiquitous and difficult to shield against, other than through massive amounts of Water/Hydrogen, which would increase the mass, cost, and time of manned flights to Mars and back. When traversing the Earth's magnetic field, the Van Allen belt and beyond, astronauts on each Apollo mission to the Moon were exposed to such radiation, with persistent effects, including 'flashes,' whenever another 1,000 neurons or so were eliminated by the crossings of such heavy particles through their neuro-system, hitting the optic nerves. Extended over many months or years the effects of such exposure can be devastating.

[5] This article employs the following customary acronyms: LEO = Low Earth Orbit, GEO = Geosynchronous Orbit, HEO = High Earth Orbit, LLO = Low Lunar Orbit, HLO = High Lunar Orbit, NEO = Near Earth Orbit.

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- The effects of **prolonged micro-gravity** on the human body, leading to effects not dissimilar to aging and affecting within hours the whole human body in a myriad of ways. Prolonged Space flights over many years – or presence in severely diminished gravity – may be 'showstoppers' to such prolonged presence. "Fractional gravity" experience e.g. $1/6^{th}$ on the Moon may indeed be 'enabling' for understanding the need or lack thereof of artificial gravity on long interplanetary voyages.
- The effects of **prolonged isolation** on the human psyche and body. Prolonged isolation, even on Earth, can have devastating effects on the mental health and physical well being of humans. The effects of mental well-being on the immune system is as yet not completely understood. Several incidents of 'burn-out' in orbit are documented. While these effects may be relatively 'easy' to cope with in near-Earth environments – permitting relatively quick returns to Earth, long distance flight (**absent the massive image of Earth from LEO or the Moon**) may pose entirely different perspectives and effects. Similarly, human judgment may be affected – sensory or otherwise.

While each of these effects may be serious – and any one of them a showstopper, the combination of 'synergistic' effects of less than disabling proportions of these effects must also be understood. There is considerable experience obtained from human Space flight missions in Low Earth Orbit (e.g., Space Stations, Space Shuttles, Soyuz flights). However, Apollo provided the only missions beyond the protective envelop of the Earth's magnetic field and the Van Allen Belt. Thus, there are only very limited data involving an environment like that to be experienced on interplanetary flights.

Each of these parameters can seriously add to – or mitigate – the cost and time of human missions to Mars. For example, if a 1-g environment were required throughout the mission, this requirement would substantially increase the mass and complexity of the mission. Similarly, if vast protective water enclosures are needed to protect

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against heavy particle radiation this requirement will increase mission mass as well. When both combine, mass requirements may increase by orders-of-magnitude, adversely affecting spacecraft design and mission parameters.

Two other key factors that limit confidence in committing to a Mars mission within a decade are the costs of transportation and time (i.e. interest). What may make sense with a few weeks' turn-around time for the Moon may become unfeasible – technically or economically – with roundtrip schedules of a few years for a single mission. This sad fact would not be ameliorated by assumed breakthroughs and advances in propulsion, nuclear rocket programs to reduce trip times and some of the listed bottlenecks in manned flights to Mars. Neither do we have such means of transportation today, nor can we be assured of measures to address associated health concerns.

Finally, **extensive human experience on the Moon is a precondition to human Space trips to Mars**, and lessons learned from this experience may provide new ways to execute missions to Mars. Preliminary missions to the moons of Mars, Deimos and Phobos, are also a prelude to human Space flight to Mars. Thus, we can develop solutions to key problems by returning to the Moon and establishing a permanent base of operations for study and exploration of that space environment.

Option III: A First Human Settlement on the Moon within a Decade

Under the above constraints on the characteristics and parameters for meeting the next major goal for Human Space exploration, **the only realistic Goal for the next decade is to establish the first human settlement outside Earth on the Moon.** From the standpoint of risk, transportation costs and travel time alone, the Moon is the first logical step to address the fundamental questions of the scope and limits of Human Space Flight beyond Earth throughout the solar system.

As Figures 2 and 3 make clear, the Moon is also the **'natural' platform to operate in Cis-Lunar space** – to GEO, to HEO and NEO, even to LEO. Once such an operational capability has been established, the 'energy' distance (the amount of propulsion needed) to reach even low earth orbits from the Moon is substantially less than reaching that same location from the 'much closer' Earth. The same holds true for any and

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all other locations in Cis and Trans-Lunar Space.

At the same time it is also clear that whereas the Moon is within a few days of Earth in case of emergencies of whatever kind – or simple re-supply operations before reaching 'Lunar autonomy' – travel to and from Mars will take years. Once having set out for Mars one can not just 'turn around' in mid-flight, a gravity assist from Mars is needed for such 'turn-around'.

As discussed below, there will be many new practical applications that result from a Lunar habitat that permits exploitation of the Moon's physical environment. Human involvement in such exploitation will be critically important. The same 'operational advantage' holds for the Mars's moons, **Deimos** and **Phobos**, when considering 'Cis-Martian' Space missions. Again, the moons may be the 'natural' initial destination, until technologies and experience beyond Earth Space mature.

Key among these innovations is a **revolution of Space transportation and Space operations** in Cis- and Trans-lunar Space and for missions into the solar system, once the aerospace community grasps the unique characteristics of Lunar resources, e.g.,

- The **abundance of energy** beyond any resource ever imagined on Earth;
- The **absence of any significant 'atmosphere';**
- The **stability of the Lunar 'platform';** and
- The abundance of **mineral resources** given the apparent 'cogeneration' of Earth and Moon in their infancy billions of years ago.

One example: Once the energy resources on the Moon have been tapped, a new era of Space transportation will open – with propellantless propulsion options**, totally changing** the 'delta-V' driven location speculations of Cis-, Trans-lunar and planetary exploration missions in and around diverse libration points. Indeed one may ask, "What good are mathematical 'optimization' exercises if propellant mass is no issue?" Thus are the potential changes wrought by a human presence on the Moon.

Finally, as pointed out in the discussion of obstacles confronting a

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national goal for human exploration of Mars (Option II), there are many issues concerning **ecological health and closed ecological life support systems** (heavy particle radiation, micro-gravity, human factors among them). The place to find the answers to these myriad of life sciences issues, the environmental health of humans in interplanetary space flight and the feasibility of Closed Ecological Life Support Systems (CELSS) is outside the Van Allen belt, yet close enough for rescue and early returns should environmental and health data indicate incipient problems. That place is the Moon, which also can supply/provide a variety of shielding and protective strategies not available in the 'void' of interplanetary space flight. The results of these Lunar *in situ* efforts could significantly reduce costs and risks of eventual future human Mars mission exploration.

Of paramount importance in this context is the question of the relative abundance or not of H_2O on the Moon. This is a hotly discussed topic, with indications from the Clementine mission that indeed such resources exist near the polar regions of the Moon. However, a more detailed assessment of the extent of these water resources on the Moon is needed, first with additional remote sensing missions, then – as in the good old days – by on-site old-fashioned geologic prospecting by humans on the Moon.

Of course, once solar energy resources are tapped on the Moon, then hydrogen can be literally 'squeezed' out of the regolith 'stones', where hydrogen and helium-3 have been 'implanted' by solar winds for billions of years.

Such a fundamental goal can make use of an extensive existing technology base, with some crucial system development components to enable such a mission by a decade after go-ahead. These include four core components,

- Space Shuttle Derivatives: Evolutionary steps toward modular, reusable liquid assist and unmanned systems options.
- Space Tug(s): A LEO-to-Lunar Surface-and-return manned Reusable Upper Stage, again modular in its various components.

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- On-Orbit fuel storage and transfer capability: For example, oxygen, hydrogen, and water that accrue in various Space missions to and from LEO (Shuttles, ISS) can be used to refuel LEO-based Space Tugs to increase efficiencies and reduce costs of missions above LEO to HEO, GEO and beyond, all the way to the Moon and back. Thereafter, these technologies can enable the use of Lunar water resources and their cracking into H_2/O_2 for Space Tug (and CELSS) operations. Solar Electric Power Space stations can provide power to Space Tugs with missions beyond the primary pull of Earth's gravity.
- Closed Ecological Life Support Systems ("CELSS"): The key technology for ultimately Earth-independent, autonomous human settlements on the Moon and in Space, with untold 'technology feedback' to Earth. The impact on the global economy of such drastically advanced recycling of resources may be similar to the effects of miniaturization in electronics, image processing and computation from the Space program of the 20th century.

Profound Education, Science and Technology Implications

One of the foundations of the vigor of free market economies – and the U.S. economy in particular – is the immense drive for innovation, which in turn is based on the 'human resources' of education, the sciences and technology.

Currently, the U.S. is experiencing a serious erosion of the foundations of its wealth, in aerospace in particular. Things we could do but a few decades ago are, in fact, today outside of our immediate reach, including the ability to return to the Moon – or even to replicate a Space Shuttle, much less to improve its design to 2000 technology. A new generation must learn again how to repeat these feats of decades ago – preferably while a few of the pioneers are still available to help. These resources – ultimately key human resources: engineers, scientists, aerospace workers – should be mobilized, maintained and expanded, not through 'make work' programs that reinvent the wheel (e.g. one more 'expendable' launch system) but through challenges that open new

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frontiers, such as exploring and exploiting the Moon.

Entirely new applications, technologies, and missions are outlined in Section G, based on the work of literally hundreds and thousands of innovators, scientists and engineers of decades past. Many others will expand that list of ideas over the next months and years. This portfolio of opportunities encompasses all areas of technology and the sciences, across literally the whole electromagnetic spectrum, all the life sciences, the communications and information economies (well over 50% of all economic activities in advanced economies), material sciences, and human factors. With the prospect of an inexhaustible energy base – be it solar, be it nuclear – there are no limits to the expansion of this new frontier other than our failure to set out to explore, breach and expand this frontier as well.

These conditions will pose an exciting challenge to the next generation of aerospace engineers and scientists. **Science and technology do not happen in the 'abstract'** – as percentages of GNP or in response to incantations of the need for more Ph.D.s, engineers, technical workers and educators; more science, statistics and mathematics; more high school science and college graduates. Such incantations and lamentations will go unanswered in the void of goals that challenge our imagination and make us take the hard road of sweat and tears, work and risk – justifying all the long and lonely hours of studies and tests and failures, and here and there the thrill of success.

The "Columbia" challenge will bring about entirely new opportunities of the Frontiers of Space, with **real life applications in the next decades.** If but a fraction of all the opportunities are pursued – requiring untold numbers of enterprising new employment prospects, the downward trend in aerospace science and engineering can be reversed, leading to an influx not only of America's youth toward a future of opportunity but an influx of untold thousands worldwide to join us in Space enterprise.

We know of no goal or enterprise – including the Manhattan Project – that has had or will have more profound impacts and open more opportunities for generations to come than this single initiative: to return to the Moon within a decade, this time for keeps.

And – lest a goal be set – NASA cannot answer the question as to

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what technologies are needed in the pursuit of Space enterprise. Based on the list of criteria in the previous section, the only realistic goal for NASA to be given for the next decade is to establish a Manned Lunar Base within ten years from go-ahead.

F. Looking at Earth from the Moon

No single image has changed our lives more than this: a lonely Earth floating precariously in the 'emptiness' of Space over the horizon of the Moon. This 'one' image has driven home the beauty, the vulnerability and the uniqueness of the planet we call Earth, more than all the volumes and libraries full of informed discussions, concerns and recommendations.

Indeed, looking again at this image, it is surprising and 'shocking' that some of that awareness has receded, at least in the minds of some of us swamped by everyday concerns and issues.

Unique 'Cis-Lunar' Properties of Space Station Moon

The 'locational' advantages of "Space Station Moon" include that:

- It is a **massive, 'airless', stable platform.**
- It has an **unlimited supply of solar energy** hitting its surface and immediate surrounds – an energy potential of about 1.3 KW per square meter (!) at an average of 1 AU. More 'impressive' is that in but ten days more solar energy 'hits' the surface of the Moon than all the known global fossil fuel resources accumulated over eons past on Earth! Without an atmosphere the energy is there for the taking.
- It can serve as an **ideal platform for emplacing nuclear reactors** and missions using these power sources in a variety of novel Space missions. Use of any number of Prometheus size reactor modules will allow any level of foreseeable power supplies as an alternative to or complement to solar power plants.
- It could also serve potentially as an ideal **testbed for 'clean' fusion** RDT&E using the 'captured' ^{3}He in Lunar soils – 'clean' insofar as fusion processes using ^{3}He generate as their major byproduct deuterium rather than the

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exceedingly volatile contaminating byproduct tritium associated with 'conventional' fusion processes.[6]

- It has only **a sixth of Earth's gravity** enabling major reductions in transport energy required (and associated delta-V) for many important operations.
- It has **most material resources needed** for Space and Lunar structures and operations, including some of the direly needed water resources (hydrogen in particular).
- Last but not least, it is only a **very short distance from Earth (in 'time' and 'delta V')**, indeed the Moon is part of 'Earth Space' and an ideal platform to observe all of Cis-Lunar space across the full electromagnetic spectrum.

A 'portfolio' of different applications, projects and missions can be assembled to illustrate many diverse technologies and concepts proposed in previous decades. With a renewed and specific commitment to return to the Moon – this time to stay, the portfolio will expand in the sciences, applied technology areas, exploration missions and practical applications on the Moon, in Cis-Lunar Space and on Earth. These will be stimulated throughout academia and the research and technology community, as well as in industry and the private sector. 'Rules of the Road' have to be defined to facilitate such co-operation and participation.

Last and not least, many of these seed technologies and programs can first be tested as to their components and critical lead items on the ISS and Low Earth Orbit, as well as laboratory simulations on Earth where appropriate.

While nobody can predict today which applications and concepts will come to fruition, what is certain is that many more and totally new uses will be found for Space, on the Moon and on Earth – with untold and likely unanticipated benefits to mankind's journey into Space towards independence from planet Earth. When such a 'Declaration of Independence' is proclaimed by communities outside Earth, then we

[6] Report of the NASA Lunar Energy Enterprise Case Study Task Force, NASA Technical Memorandum 101652, July 1989, 171 p.

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shall know that our journey into Space has been successful.

The Cis-Lunar Information Economy

One cannot overstate the importance and scope that the Space age has brought to revolutionizing the information sector of the economy – globally, regionally and locally. Few are aware that when asking 'the computer' for driving and location directions these data have been gathered from Cis-Lunar Space – some in real time and some in laborious work over many decades, such as topographic and thematic map information. Similarly, when each day about $1 trillion circle the global economy looking for investment opportunities or trade, these monetary flows are enabled by satellite communications to many remote areas in the world.

Agricultural resources, crop data, land use information, water resources, forestry, desertification, urban sprawl – all these subjects and more have been vastly affected by Space. Today, when a U.S. farmer operates his harvester, the location of his vehicle is determined by GPS; crop quality, soil moisture and yield information is transmitted 'real time' via satellite links into various data banks; and synthesized analysis returns to the farmer for decision-making on fertilizing that specific field in that specific location, with those specific soil conditions and for a specific crop – which he selected based on all the global crop data collected and transmitted, again globally via satellite.

All these processes today occur continuously, 24 hours a day, 365 days a year. At any time, crops are harvested in either the Northern or Southern hemispheres, ranging from tropical zones all the way to the Arctic. There is not a single month in which some wheat somewhere in the world is not harvested, given winter and spring wheat and all the 'zones' where wheat is grown. Today's trading department in many a commodity company looks more like the Houston Apollo mission command center than the idyllic images of bespectacled 'desk' traders of centuries past.

And depending on the season, anywhere from 10% to 40% of all the 'news' reporting on media world-wide has to do with weather and climate – daily schedules are affected as are a myriad of decisions, many based on 'forecasts' rather than on 'facts.' We act upon such forecasts

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today because the quality of these forecasts has advanced substantially since the days of the farmers' almanac. Data and information derived therefrom are mostly gathered again from Space.

For example, instruments on the TIROS series of weather satellites (the MSU) have taken ~30,000 atmospheric temperature measurements around the globe for the past 25 years (since 1979), aggregated daily at 1:30 a.m. and at 1:30 p.m. astronomical time. Each dot in the image in Figure 6 represents an actual temperature measurement at the 'precise' astronomical local time of 1:30 a.m., with the color of each dot denoting the temperature measured between 230K and 280K degrees (Kelvin). These data provide a true, accurate, 'measured' assessment of eventual temperature and climate change – an effective counter to fear mongering and 'precautionary measures' with untold costs to the economy and trade world-wide amounting to billions of dollars and untold regulatory constraints. [See Figure 7]

Similar examples of data gathered and distributed globally from Space now exist in an untold variety of areas too numerous all to be listed. Yet many gaps in our observations continue to exist and many of the data, valuable as they could be, are still being gathered, collected and distributed often in a haphazard way and often to a select few.

G. Observations of Cis- and Trans-Lunar Space:
A Dual Use Observation Co-operative Infrastructure

The Moon as an operational platform from which to observe Earth and all of Cis-Lunar and Trans-Lunar Space will again revolutionize "Earth Observations" capabilities, especially when integrated with other Cis-Lunar capabilities. Just as with the Hubble Space Telescope, entirely new vistas and possibilities will be opened with the ability to deploy and tend large observatories across the full electromagnetic spectrum and with hitherto unheard of apertures – on the 'front side' of the Moon for Cis-Lunar Space and Earth and on the 'back side' of the Moon for hitherto unimaginably detailed astronomy observations of the universe.

The 'Earth oriented' applications listed in Figure 8 include large active and passive optical and RF collectors for 'long dwell' high resolution earth-system observations; ultra-long range identification and tracking of Earth orbit crossing objects; observation and tracking of

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Earth orbiting objects and activities; and ultra precise measurements of Earth and Cis-Lunar parameters such as the gravitational Earth 'surface' (the Geoid), topographic data, and other real time, continuous measurements.

With the use of entirely new orbit capabilities and locations enabled by support from Lunar bases, other applications will be enabled – including large and unusually complex structures. Included are real time continuous high resolution applications for the Lunar polar zones (North and South poles). These applications were not 'newly invented' here to justify some expensive Space scheme. As applied to astronomy, they were part and parcel of the 1969 Space Task Group recommendations, as illustrated in their summary of space applications reproduced in Figure 9. These recommendations included four large observatory initiatives:

- *A Lunar Based Optical Interferometer*. See Bernard F. Burke, "Astronomical Interferometry on the Moon (1982)," who made the case for high angular resolution, aperture synthesis and a Lunar VLA for a maximum baseline length of 10 km. Adopting radio wavelength Interferometry to an optical VLA would lead to a qualitative advance in our understanding of the universe.
- *A Lunar Based large Solar (Coronal) Observatory and Neutrino Observatory*. Again, in the latter case – neutrino observations – the severe background over a large range of energies can be alleviated by making such observatories on the Moon [M.M. Shapiro, R. Silberberg, M. Cherry, K. Lande, A.G. Petschek, among others].
- *Large Scale Lunar Based X-Ray and Gamma Ray Observatories*, making use of the Moon's advantageous low radioactive environment when compared with the Earth's surface or atmosphere. Background radiation from surroundings will be lower on the Lunar surface than it in satellites in orbit around Earth. The Moon is well beyond the regions where the geomagnetically trapped particles

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exist, nor will there be activation by the intense particle fluxes encountered in the South Atlantic Anomaly.

- *A Ten Kilometer Radio Telescope*. As expanded on by Jack O. Burns ["A Moon-Earth Radio Interferometer", 1982], enabling significant advances in astrometry via the measurement of the celestial coordinate system – thereby improving celestial navigation and astronomical timekeeping and synthesis mapping for the mapping of radio bursts of stars, our galactic center as well as other galaxies to orders of magnitude greater accuracies and detail. A more recent concept of one such observatory is shown in Figure 10.

These structures cannot 'assemble themselves' in the abstract, nor can they be operated, maintained and updated without substantial, continuous human participation in their deployment, maintenance and operation.

Synergistic 'Payload Effects' for Astronomy/Observation Programs across the Electro-Magnetic Spactrum

Billions and billions of dollars are expended on large astronomical observatories: be it the Hubble Space Telescope, Chandra, Compton, the two dozen or more small and large observatories deployed, being built or on the drawing boards, they are all 'handcrafted' today with the scientific instrument itself but a fraction of the overall payload and spacecraft costs and data processing and communications. An enormous amount of energy and instrumantation is expended on maintaining the orbits and environmental conditions of these fragile structures – and they invariably fail, often for trivial reasons: Compton because the gyros went out of control (there go $1.5 billion), Chandra because something seems to be 'fogging up' the viewing surface (for want of a Kleenex, here go another $1.5 billion), the Hubble Space Telescope because of a perceived risk for a refurbishment mission (there goes the most successful observatory ever in the history of astronomy).

The Moon opens entirely novel perspectives and opportunities: what if one were to take all the proposed observing instruments and deploy them in an **"astronomy/observations" co-operative (or**

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condominium), with common energy, thermal management, absolutely 'stable' deployment, without atmospheric interferrences and comprehensive protection against solar and cosmic 'weather', common or shared data processing and communication systems and command and control infrastructure as well as the ability for "on-site" maintenance (preventive and repairs), updating and replacements? Rather than the 'current' life cycle of large astronomy observatories of a decade of "sale", followed by a decade of "construction and deployment" to finally a decade of use (if all goes well) to be followed by a decadal 'discontinuity through the 'next' observatory' one would here finally establish a continuous astronomy/observation facility of enormous flexibility – applicable to instruments across the electromagnetic spectrum, with distributed apertures of stable geometry of hithertoo unimaginable dimension and resolution – all for a fraction of the cost of individually handcrafted and built observatories of accidental functionality.

Just a 'diagonal review' of all the observation instruments and observatories proposed – e.g. several for deployment at L2 – reveals a nearly unlimited potential for such deployment on the Moon for co-operative services and use.

Science Observatories currently under Development:

The Relativity Mission – Gravity Probe-B

(Launch: 2004 April)

The experiment now known as Gravity Probe B was conceived more than 30 years ago. The aim of the experiment is to measure, rather precisely, an effect that is predicted by all viable relativistic theories of gravity but has not yet been observed. Just as Newton's law of gravity is paralleled by Coulomb's law of electricity, so also it is expected that the force between currents of electrical charge, described by Ampere's law, should be paralleled by a force between "currents" of flowing matter. It is this force that has never been directly observed.

Swift Gamma Ray Burst Explorer

(Launch: 2004 September)

Swift is a three-telescope space observatory for studying the position, brightness, and physical properties of gamma ray bursts. Although

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gamma ray bursts are the largest known explosions in the Universe, outshining the rest of the Universe when they explode unpredictably in distant galaxies, their underlying nature and the cause of the explosion are true mysteries of astrophysics. Swift was selected in October 1999 as a MIDEX mission.

Coupled Ion-Neutral Dynamics investigation

(Launch: 2004 November)

CINDI is a mission to understand the dynamics of the Earth's ionosphere. CINDI will provide two instruments for the **Communication/Navigation Outage Forecast System (C/NOFS)** satellite, a project of the United State Air Force. CINDI was **selected for flight for as a Mission of Opportunity under the SMEX-2000 AO.**

Deep Impact

(Launch: 2004 December)

Deep Impact was selected in July 1999 as a future Discovery mission. It is designed to fire a copper projectile weighing about 350 kilograms (about 770 pounds) into the comet P/Tempel 1, excavating a large crater more than 20 meters (65 feet) deep, in order to expose its pristine interior ice and rock.

Astro-E2

(Launch: 2005 February)

In July 2001, we announced that we would **participate with Japan in rebuilding the Astro-E spacecraft.** original Astro-E was launched February 10, 2000, but there was a problem with the first stage of the Japanese rocket, and the satellite was declared unusable. Astro-E2 will provide powerful tools to use the Universe as a laboratory for unraveling complex, high-energy processes and the behavior of matter under extreme conditions.

Space Technology 5

(Launch: 2005 May)

ST5, or the Nanosat Constellation Trailblazer mission, is the fourth deep space mission in our New Millennium Program. ST5 will test methods for operating a constellation of spacecraft as a single system, using three miniature spacecraft. Each spacecraft is about the size of a

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birthday cake. The mission will also test eight innovative new technologies.

Solar Terrestrial Relations Observatory

(Launch: 2005 November)

Coronal mass ejections (CMEs) are powerful eruptions in which as much as ten billion tons of the Sun's atmosphere can be blown into interplanetary space. The goal of STEREO is to understand the origin coronal mass ejections and their consequences for Earth. The mission will consist of two spacecraft, one leading and the other lagging Earth in its orbit. The spacecraft will each carry instrumentation for solar imaging and for in-situ sampling of the solar wind. STEREO is a Solar Terrestrial Probe mission.

Solar-B

(Launch: 2006 September)

Solar-B is a Japanese ISAS mission proposed as a follow-on to the highly successful Japan/US/UK Yohkoh (Solar-A) collaboration. The mission consists of a coordinated set of optical, EUV and X-ray instruments that will study the interaction between the Sun's magnetic field and its high temperature, ionized atmosphere. The result will be an improved understanding of the mechanisms which give rise to solar magnetic variability and how this variability modulates the total solar output and creates the driving force behind space weather.

Gamma ray Large Area Space Telescope

(Launch: 2007 February)

GLAST will use particle accelerator detector technology to study the high energy gamma rays from natural particle accelerators throughout the Universe. With GLAST, astronomers will have a superior tool to study how black holes, notorious for pulling matter in, can accelerate jets of gas outward at fantastic speeds. Physicists will be able to study subatomic particles at energies far greater than those seen in ground-based particle accelerators. And cosmologists will gain valuable information about the birth and early evolution of the Universe. GLAST will map the sky with 100 times the sensitivity, resolution, and coverage of previous high energy gamma ray missions. GLAST is a collaboration with the Department of Energy and several foreign space agencies.

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Herschel

(Launch: 2007 February)

Herschel is cornerstone number 4 (CS4) in the European Space Agency's "Horizon 2000" science plan. It will permit high spatial and spectral resolution imaging in the 85-900 micron wavelength region. Superb sensitivity for both photometry and spectroscopy will result from Herschel's high throughput and low thermal background. Herschel will be a multipurpose observatory serving the entire astronomical community. NASA supports U.S. participation on the mission.

Planck

(Launch: 2007 February)

Planck is the third Medium-Sized Mission (M3) of the European Space Agency's Horizon 2000 Scientific Programme. It is designed to image minor variations in the Cosmic Background Radiation over the whole sky, with unprecedented sensitivity and angular resolution. Planck will provide a major source of information relevant to several cosmological and astrophysical issues, such as testing theories of the early universe and the origin of cosmic structure. NASA supports U.S. participation on the mission.

Science Observatories under Study:

Dark Universe Observatory

The DUO mission would include seven X-ray telescopes to measure the dark matter and dark energy that dominate the content of the universe, with 100 times the sensitivity of previous X-ray studies. DUO was **selected for study as a potential Small Explorer mission** in November 2003.

Extreme Universe Space Observatory

EUSO would detect the highest-energy cosmic rays known by using the entire Earth as a particle detector. EUSO will look down on the Earth's atmosphere to observe the characteristic blue light that high-energy cosmic rays generate after hitting the Earth's atmosphere. EUSO is under study by the European Space Agency for flight on the Columbus module of the ISS, and NASA would provide the large Fresnel lens for the telescope.

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Geospace Missions

The goal of the Geospace missions is to increase understanding of how the Earth's ionosphere and magnetosphere respond to changes due to solar variability. Geospace is a component of the Living with a Star initiative.

Global Electrodynamic Connections

GEC is planned as a cluster of 4 satellites, combined with ground-based observations, that will make systematic multi-point measurements to complete our understanding of the roles played by the ionosphere and thermosphere in the Sun-Earth connection. GEC is a future Solar Terrestrial Probe mission.

Interstellar Boundary Explorer

The IBEX mission would include a pair of cameras to image the boundary between the solar system and interstellar space with 100 times the sensitivity of previous experiments. IBEX **was selected for study as a potential Small Explorer mission** in November 2003.

James Webb Space Telescope

James Webb Space Telescope (formerly the Next Generation Space Telescope) is designed for observations in the far visible to the mid infrared part of the spectrum. This wavelength coverage is different from that of the HST which covers the range from the ultraviolet to the near infrared. JWST will probe the era when stars and galaxies started to form; it will also address many other astronomical questions.

Kepler

The Kepler mission is a space telescope specifically designed to detect Earth-sized planets around stars in the Sun's neighborhood of the galaxy. By monitoring 100,000 stars over a four-year mission, Kepler could detect up to 500 Earth-sized planets and up to 1000 Jupiter-sized planets. Kepler was selected in December 2001 as a Discovery mission.

Laser Interferometer Space Antenna

LISA is a gravity wave telescope which will open up one of the last non-electromagnetic channels for studying the Universe. Its goal is to detect gravitational radiation with periods of minutes to hours such as that produced by two coalescing massive black holes in a distant galaxy.

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LISA will also provide an unprecedented test of strong field general relativity theory. LISA is identified in the OSS Strategic Plan.

Magnetospheric Multiscale

Broad regions of the Earth's magnetosphere are connected by fundamental processes operating in thin boundary layers. Processes of vastly different scale sizes can interact strongly. Understanding these fundamental processes requires multipoint measurements that uniquely separate temporal and three-dimensional spatial variations. The MMS mission goal is to make those necessary measurements with a five spacecraft constellation in highly eliptical orbits. In September 2003 we announced **the selection of two proposed mission concepts for further study.** MMS is a future Solar-Terrestrial Probe mission.

Normal-incidence Extreme Ultraviolet Spectrometer

NEXUS is a solar spectrometer mission, with major advances in sensitivity and resolution to reveal the cause of coronal heating and solar wind acceleration. NEXUS was **selected for study as a potential Small Explorer mission** in November 2003.

Nuclear Spectroscopic Telescope Array

NuSTAR is a telescope intended to carry out a census of black holes with 1000 times more sensitivity than previous experiments. NuSTAR was **selected for study as a potential Small Explorer mission** in November 2003.

Sentinels

To improve accuracy of space weather predictions, the Sentinels mission will characterize the environment through which solar disturbances propagate and study their evolution. Sentinels is a future mission in our Living with a Star initiative.

Solar Dynamics Observatory

How does the solar interior vary through a solar cycle? How does this variation manifest itself in the structure of the Sun's corona and heliosphere? What is the origin and effect of sunspots and solar active magnetic regions? SDO is designed to answer these and other questions, and is a future mission in our Living with a Star initiative.

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Space Interferometry Mission

SIM will be the world's first long-baseline optical interferometer in space, and a technological precursor to the Terrestrial Planet Finder. With its unprecedented astronomical accuracy and high spatial resolution, SIM will allow indirect detection of planets through observation of thousands of stars, and will investigate the structure of planetary disks.

Terrestrial Planet Finder

TPF is currently envisioned as a long baseline infrared interferometer, operating in the 7-20um wavelength range. This range is an excellent region for the direct detection of terrestrial planetary companions to other stars, and also for detecting spectral lines which might indicate a habitable planet.

Widefield Infrared Survey Explorer

WISE is an infrared telescope designed to survey the entire sky with 1,000 times more sensitivity than previous missions. WISE would be led by Edward L. Wright of the University of California, Los Angeles. WISE (originally named the Next Generation Sky Survey, NGSS) was selected as a potential Mid-Class Explorer (MIDEX) in April 2002; in March 2003 WISE was approved for further study. A decision on proceeding to flight development with WISE will be made in 2004.

H. Assembly and Deployment of Large Space Structures

Indeed, the ability to assemble and operate in Space large structures – such as the assembly of International Space Station – opens up entirely new perspectives in the scope and scale of Space observations and Space applications – on the Moon and in all of Cis-Lunar Space, including at various libration points. The implications and 'derivatives' of these vastly expanded or entirely new applications in communications, observations, navigation and information activities worldwide can hardly be imagined, much less quantified, other than to state that the impacts will be enormous and utterly beneficial to all mankind. One such future deployment and operation is shown in Figure 11.

It is not the purpose of this report to highlight and identify all potential applications – a task for years to come and part of a 'dynamic' portfolio of Space applications and sciences opportunities that should be

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assembled as part of this initiative. Figure 12 is but one example, ultra-large interferometers deployed in this case in geo-synchronous orbit.[7]

There are dozens more proposed concepts that need investigation and reevaluation in light of their being enabled and supported from a Lunar base. For example, the abundance of energy on the Moon and the ready availability of most material resources on the Moon can dramatically transform the 'economics' of Space transportation in Cis- and Trans-Lunar Space. Once energy is no longer a limiting factor, building the energy supplies for these new modes of in-Space transportation on the Moon will be preferable to other locations such as the various libration points – which are of mathematical and esthetic importance.[8]

I. Testbed for Revolutionary Concepts, Including Production of Energy and Other Resources

The Lunar base will serve in subsequent decades as a testbed for Human Exploration beyond the Moon – to Mars, the Asteroids or further in the future the outer planets. As time passes, reductions in risk/cost and time optimization for viable mission designs are expected for Trans-Lunar crewed missions in the future. CELSS and related Environmental Health RDT&E on Space Exploration should be directed toward achieving critical milestones to support NASA Exploration Missions beyond the Lunar base, including for interplanetary missions[9]. In the most primitive sense, components of the ISS could be deployed on the Moon with minimal adaptations as a first step.

Results from detailed **Monte Carlo simulations of the effects of CELSS derived benefits on issues of fractional gravity**[10], radiation and human factors advances on Mars missions (using the mission requirements of the Mars "Sprint" mission proposed in the 1990s as a specific example are shown in Figure 13.

Depending on the outcome of the Environmental Health and

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[7] Bekey, Ivan, *Advanced Space System Concepts and Technologies: 2010 – 2030,* The Aerospace Corporation, El Segundo, California and AIAA Inc., Reston, Virginia, 2003.

[8] Among the many studies on lunar energy related matters: *Report of NASA Lunar Energy Enterprise Case Study Task Force,* NASA Technical Memorandum 101652, July 1989.

[9] Heiss, Klaus P. and Francis Sand, "Exploration Missions and Life Sciences: Issues and Linkages", *op.cit.*

[10] ibid.

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CELSS assessments and advances, the cost (and risk, schedule) impact on but one relatively simple Mars Mission (Sprint) would be in the billions of dollars.

The benefits of finding out about these critical enabling parameters for future missions beyond the Moon to Mars or other planetary bodies are large indeed. Without this practical experience in near-Earth space – including the ability to rescue and intervene when unexpected health and safety problems arise, any commitment today, or even serious consideration, to proceed responsibly to Mars or anywhere else would occur with very limited knowledge and empirical data and experience.

In that sense, the Moon is the 'natural' Space Station for Earth, an ideal and economic platform to find out the answers to some of the most fundamental questions as to the feasibility of sustained human presence at, and possibly even independent settlements of, Lunar outposts on a continuing journey in Space.

For sure we owe posterity these investments into the future 'prospectives' of the United States and of mankind to find out whether our world is 'closed' – or is open for further unlimited exploration and expansion.

Many conceptual studies have been inspired by the pioneering contributions by Peter Glaser dating back to 1968 – or for that matter the very first writings on practical Space applications by Hermann Oberth in his seminal work of the 1920s. Still, much work remains to be done. Yet what is certain already is that energy on the Moon, and in the future times from the Moon, is abundant, indeed inexhaustible.

In the initial build-up to these capabilities, the Prometheus nuclear space power capabilities can more than suffice. The next significant step will be to build the first significant Lunar solar power generating capacity, say to achieve a 10 GW Solar Electric Prototype for Moon based Cis-Lunar Applications and Operations [See Figure 14.][11]:

To provide 10 GWe for Lunar and Cis-Lunar uses, about 2340 km^2 to a depth of 30 cm have to be moved and processed – the equivalent to

[11] Criswell, David R., "The Initial Lunar Supply Base," in *Space Resources and Space Settlements*, eds. J. Billington, W. Galbreath, and B. O'Leary, pp. 207-224, NASASP-428 and testimony by David Criswell to the U.S. Senate, November 2003 (to be published).

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moving 1.4 billion tons (at 1/6 Earth gravity). Lunar machines to process 10^6 tons per year have been designed to produce glazed solar cells entirely with lunar materials.[12] A total of about 800 km^2 would be prepared. Abundant thermal energy for glazing is available as well.

The science, technology and economic implications of having 10 GWe available are enormous for any number of Cis- and Trans-Lunar applications. Practically unlimited power could be supplied to all Earth orbiting spacecraft (when compared to to-day's miserly power budgets in Space operations) – i.e., it would herald the advent of propellant-less Space transportation technologies near Earth and to destinations throughout the Solar system and beyond, with entirely new orbits enabled around Earth and, when combined with Space Sail technologies, the ability to reach up to a third the speed of light with Hybrid Electric Impulse Space Sails.

Equally important, the RDT&E and subsequent implementation of Lunar Solar Power plants will have significant major "side" benefits. The maturing of technologies for the use of Lunar resources could lead to 90% or higher independence from Earth-based supplies.

J. Testbed for Use of Lunar/Planetary Resources:
Key to Human Solar System Exploration and Habitation.

The material composition of the Moon is quite similar to that of Earth – not surprising given their common origin – with only hydrogen as a truly scarce element. But here again the same material processed for the construction of the LSPs, regolith, also contains significant amounts of H_2 and – possibly equally important as to energy futures – ^3He, a helium isotope. Both elements are readily recoverable in regolith processing, the simplest method being through microwave irradiation. Pepin found that heating Lunar regolith (obtained from the Apollo missions) caused the He3 to be evolved above 200 C – and by 600 C about 75% of the He gas could be removed[13]. It is anticipated that if heating to 600 -700 is achieved, various other volatiles can be collected in addition to ^3He – e.g., H_2, He4, H_2O, C compounds and N_2. The

[12] Criswell D. R., "Solar Power Systems: Review of the technology base of an operational LSP System," *Acta Astronautica (2000)*, Vol. 46, No. 8, 531 – 540, Elsevier Sciences Ltd.

[13] Pepin R. O. et al., *Proceedings of the 11th Lunar Scientific Conference*, Vol. 2, 1435 (1970)

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relative amounts of "by-products" from the production of a single ton of ^{3}He are shown in Figure 15[14].

For every metric ton of ^{3}He, 6,100 tons of H_2 and 3,300 tons of water would be produced, in addition to 500 tons of nitrogen, 4,000 tons of CO and CO_2 and 1,600 tons of methane – all of these elements are important to establishing an autonomous Lunar agricultural base and "bio-environment". The 6,100 tons of hydrogen alone would cost billions of dollars if transported from the Earth to the Moon. This is in addition to any water that might be found e.g. at the poles as indicated by data from the Clementine mission.

Once the "*in-situ*" Lunar materials processing and LSP technologies have been developed, they can be extended to support Cis- and Trans-Lunar missions and Space structures to: (a) provide power supplies for varied space operations; (b) enable propellant-less Space transportation and station keeping capabilities and (c) provide large parts of "future generation" large Space structures. The most ambitious scheme was proposed by Peter Glaser in 1968[15], inspiring most of the derivative opportunities described here. The use of Lunar materials for the economic deployment of such structures – or power relay stations from the Moon to Earth – was identified in the Minority Report of the NRC on SPS in the early 1980s and studied in detail in 1989, as depicted in Figure 16[16].

"Looking out" toward Trans-Lunar Space, the Solar system and beyond, the Moon – combined with the power supply systems outlined herein – will be the natural "Rock of Gibraltar," providing the jumping-off point to any and all destinations beyond Earth orbit. This is NOT because of some esoteric properties of Lagrangian equilibrium points – interesting as these might be for the mathematically challenged – but because of the Moon's unique 'locational' combination of resources, 'platform stability', vast real estate for deployment of instruments and facilities and, last but not least, inexhaustible energy supplies. An era of

[14] Cameron E. N., University of Wisconsin Report, WCSAR-TR-AR3-8708 (1987)

[15] Glaser P. E., "Power from the Sun: ist Future," *Science*, 162, 857 – 866 (1968).

[16] Lunar Energy Enterprise Task Force, *Report of NASA Lunar Energy Enterprise Case Study Task Force,* NASA Technical Memorandum 101652, July 1989, 171 p.

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'propellant-less' Space transportation can be enabled by the Moon and from the Moon.

The LSP technology and production infrastructure can be used with equal effectiveness and synergistically for the deployment of distributed aperture observatories across the electromagnetic spectrum (infrared, optical, microwave, x-ray and gamma ray, active or passive). As suggested by Criswell, one can combine any number of these with LSP facilities. One such base could provide a 15,000 km^2 Lunar front- or backside-collector-observatory area. Specifically, comets and asteroids capable of endangering Earth could be detected – and possibly intercepted – in advance of a threat of impact. As calculated by Criswell and others, a Lunar Power base of 100 km apparent diameter, operating at 0.1 cm wavelength can focus solar intensity beams to a less than 100 km spot size out to 10^{10} km – twice the distance from the Earth to Saturn. By irradiating incoming comets these would be gradually heated, giving off ejected gas and dust. Their trajectories can be thus modified to 'side-step' the Earth or the Moon. Comets of less than 100m diameter may be obliterated completely.[17]

The same power and technology can be used to propel vast Space (Solar) Sails of 100 km diameter – via laser or microwave beams – to any point in the Solar system and to points beyond. More than half a dozen viable schemes for such sails were proposed and identified in the 1992 Columbus Space Sail competition, which led to the flight of the first Solar Sail into Space on February 5, 1993, as indicated in Figure 17.

Equally interesting – at least for near-Earth applications – will be RDT&E and possible deployment of "Space Elevators" to L1 (for Cis-Lunar missions) and L2 (for Trans-Lunar missions), a concept first proposed by Artsutanov[18]. If combined with electromagnetic launch capabilities on the Moon to reach L1 and L2, both locations might help assemble ultra-large Space structures extending potentially over 100 miles to then be relocated from there to destinations around Earth and

[17] Weaver H. A., "HST and VLT investigation of the fragments of comet C/1999 S4 (LINEAR)," *Science*, 292, No. 5520, 1329 – 1333.

[18] Artsutanov Y., *Into Space without Rockets: A New Idea for Space Launch*, AFSC Foreign Technology Division Report ADA084597, Air Force Systems Command, Wright-Patterson AFB, 1969 (first published in Russian on July 31, 1960).

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throughout the Solar system. [See Figure 18]

Whereas any deployment and use of such elevator concepts from the Earth are totally outside known materials technology capabilities (not to mention the impact of the severe adverse atmospheric and environmental conditions around Earth), the Moon presents an ideal testbed for their exploration and implementation.

Conclusions

The technology and science vistas opened by the development of a Lunar resources infrastructure are truly breathtaking: Once the **'mental block'** of thinking about the Moon as nothing but a way-station to destinations beyond the Moon – barren of any interest and potential of its own – has been overcome, a world of vast new opportunities for Earth and for human exploration throughout the Solar system will have been opened.

The **"Portfolio of Opportunities"** remains to be filled out and described and then implemented where warranted by science, technology and the market. With regard to direct benefits to economies on Earth the constraints imposed by economic laws will limit these to commodities (goods and services) of close to zero mass and traveling close to the speed of light: communications, observations, the information sector and – when enabled by Lunar resources – vast, abundant energy supplies in the long run.

The ultimate, non-Archimedean accomplishment of Lunar Space exploration may be the establishment of **the first Earth independent settlement of humans** – the ultimate historical achievement transcending any crass utilitarian or for that matter scientific accomplishment. Should we desist in leading, others will eventually lead, like the barbarians' of centuries past when China was evaluating its exploration options and their costs in 1423.

We should take the first step, as a few colonists did in Jamestown about 400 years ago – to establish the first habitat and provide the necessary energy supplies that enable all other uses of resources and life support. In the long run, that may be the most significant impact and consequence of establishing a 'Columbia' Base on the Moon – to answer the question of the ability of humans to live and sustain themselves in

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Space. The direct benefits of such a base will go a long way to allow us an informed judgment.

Once we have learned how to 'walk on the Moon' by mastering the myriad of technology, life sciences, services and production issues on the Moon as the obvious near Earth test-bed, then and only then will it be time to think of human voyages beyond – if these are found to be possible and warranted.

In the meantime the Moon opens a vast opportunity for a range of 'dual use' (astronomical and Earth observation) **Observation Co-operatives** deployed on various sites on the Lunar surface with **common infrastructure elements** and services, on a **'stable' platform** assuring entirely new levels of resolution and observations across the full electro-magnetic spectrum, particle and gravitational phenomena, un-encumbered by the atmosphere and severe weather of Earth that promises to vastly reduce the costs of major astronomical observation facilities and for the first time assure a continuity of facilities.

The only amazing thing is that the community of astronomers at least to-date seems to have mostly missed or forgotten the exciting prospects first identified for such applications in the Space Task Force report of 1969: which only goes to show that there can also be a decay of knowledge, knowledge that is not automatically transmitted from generation to generation, lest we not persist in the quest for human Space exploration. Therein humans – even of the much maligned Middle Ages – had vistas and perspectives vastly exceeding our aspirations, such as Dante Alighieri when he concludes each of his three parts of the Divine Comedy with the words *"alle stele"* – "to the stars". How many academic degrees does it take to abandon this quest for human Space exploration full of untold risks in favor of a retreat to the 'comforts' of our caves here on Earth?

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Figure 1: The Problem

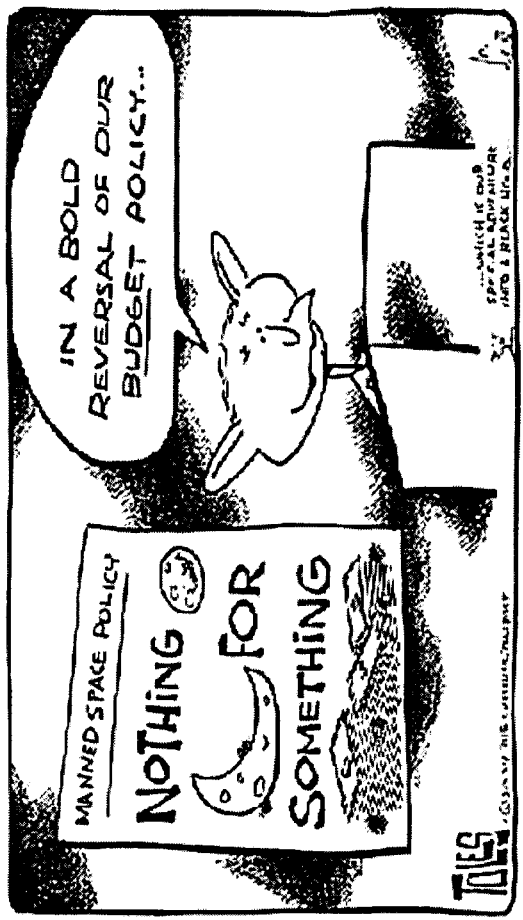

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Figure 2: "Delta- V" and Time Budgets from Earth to Moon and Mars

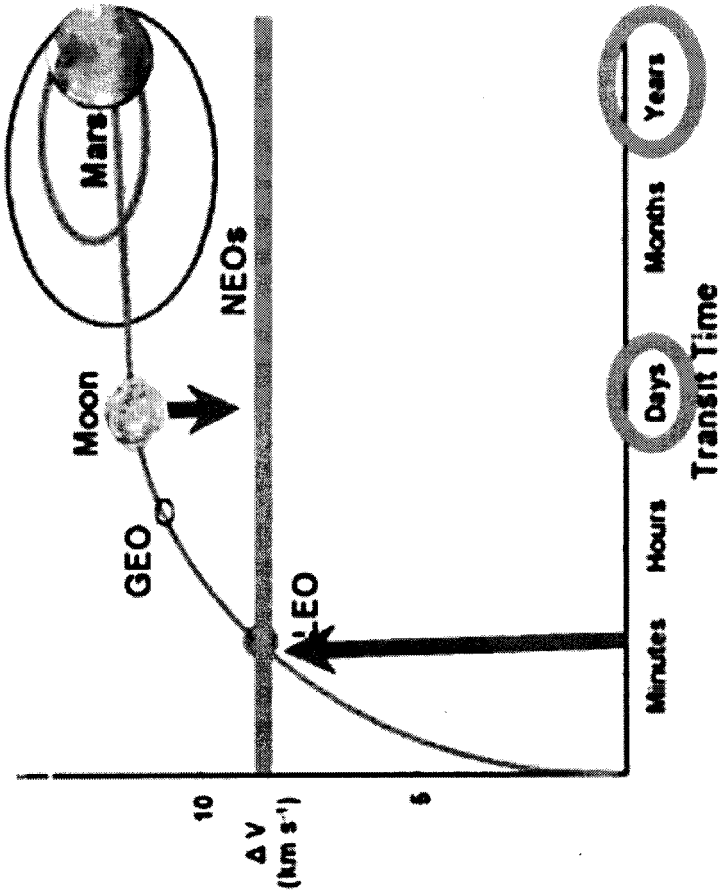

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Figure 3: Inner Solar System Gravity Wells

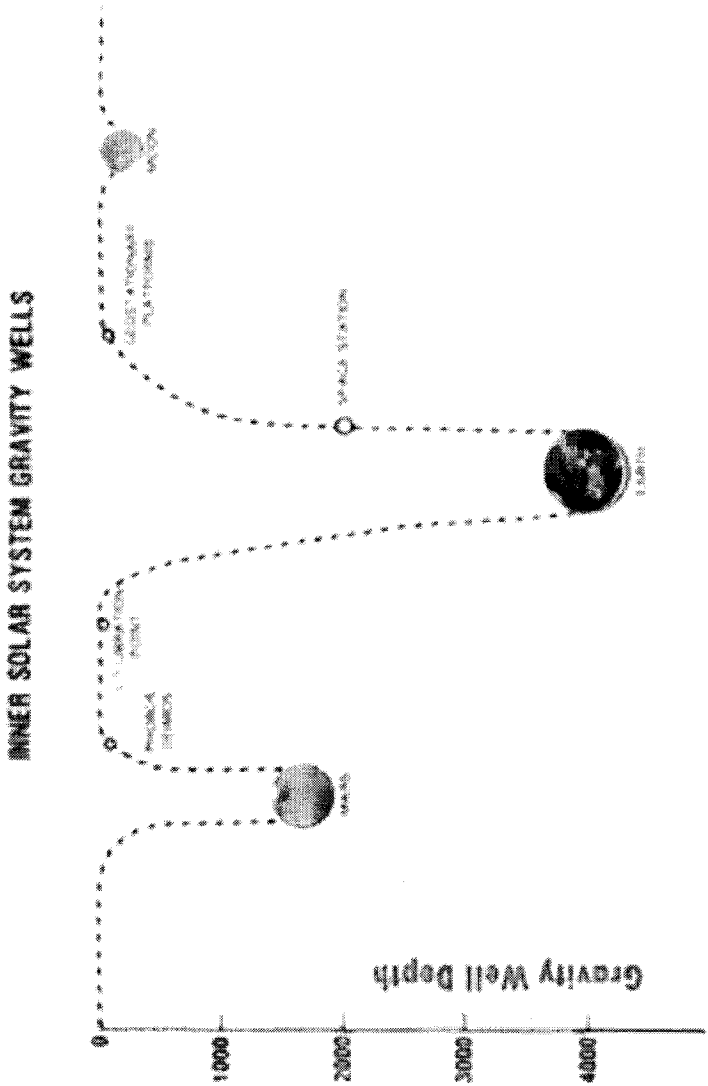

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Figure 4: Composite Image of Lunar South Pole – Clementine Mission

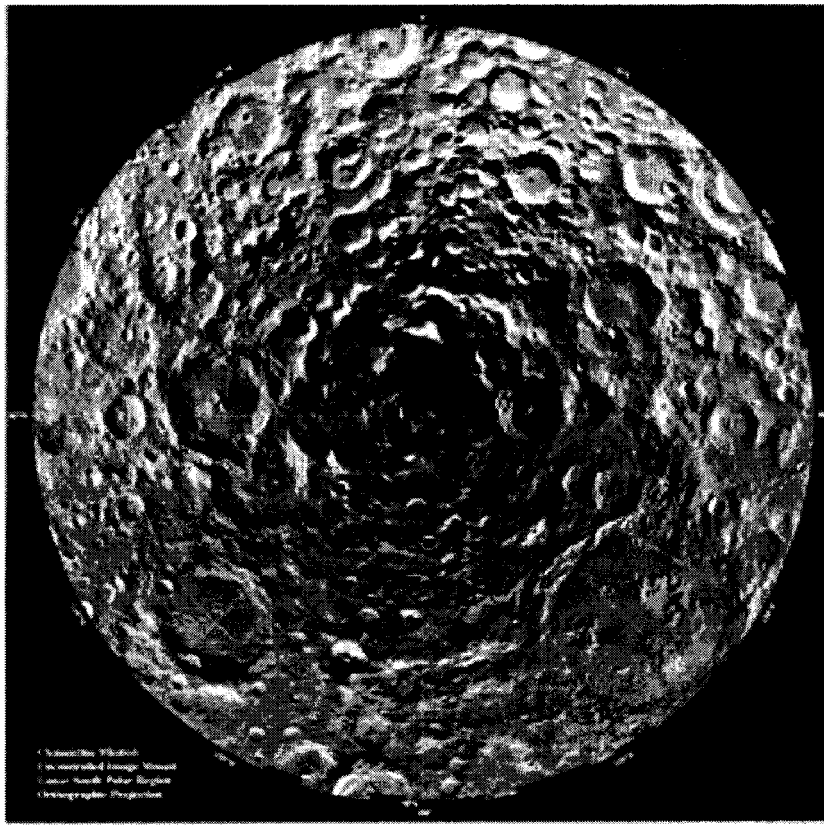

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Figure 5: Closed Ecological Life Support Support Systems

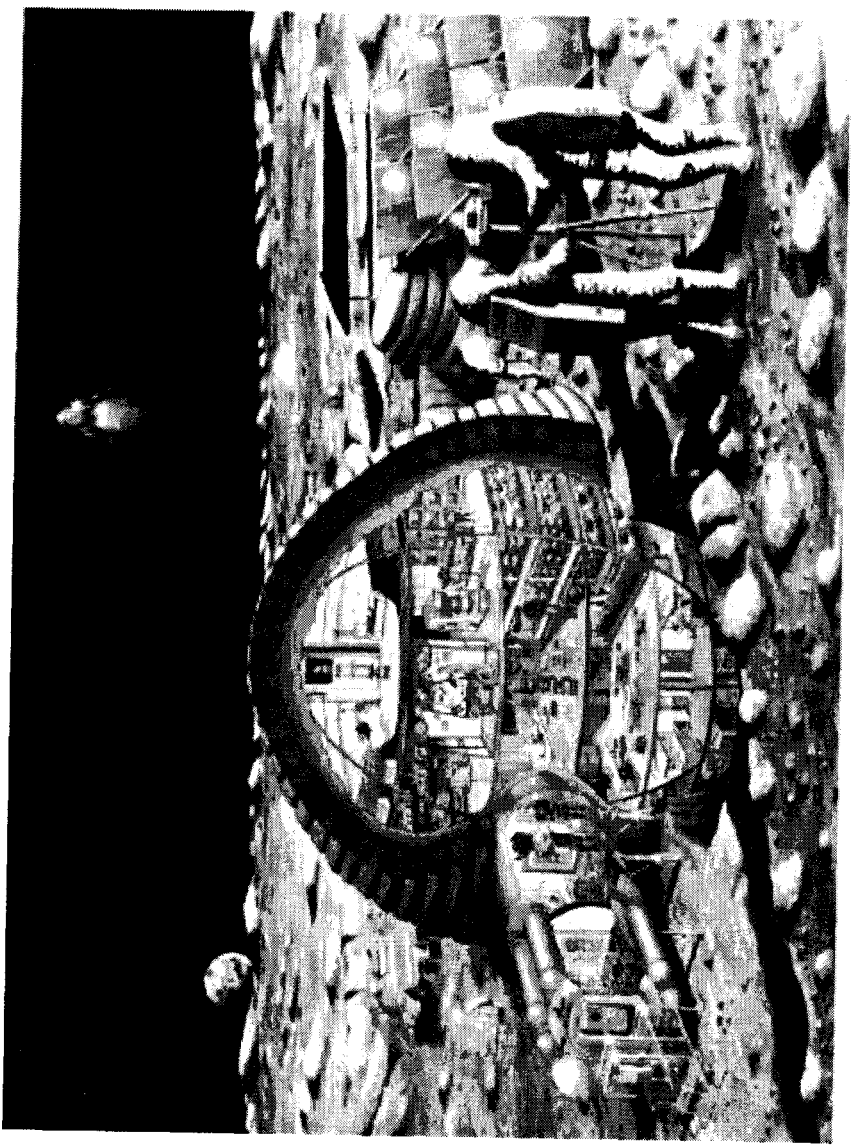

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Figure 6: TIROS MSU Data of May 8th 1998

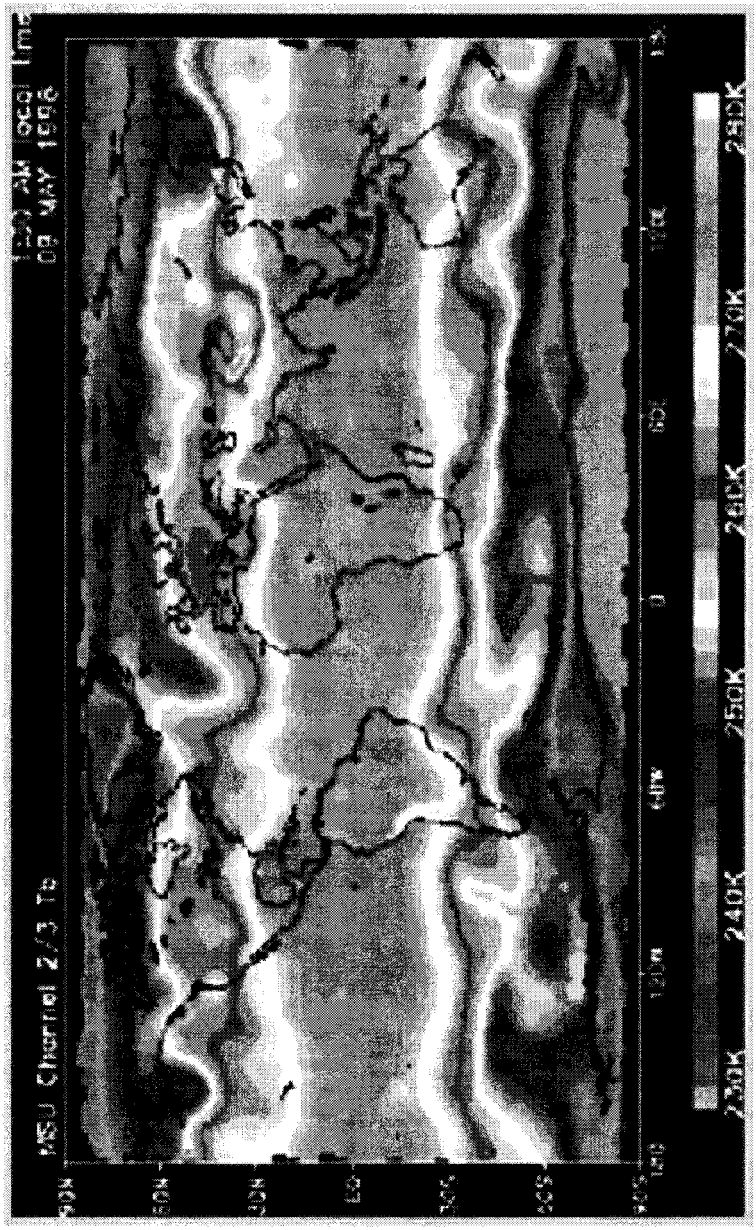

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Figure 7: Lower Troposphere MSU Temperature Data – Past 24 Years

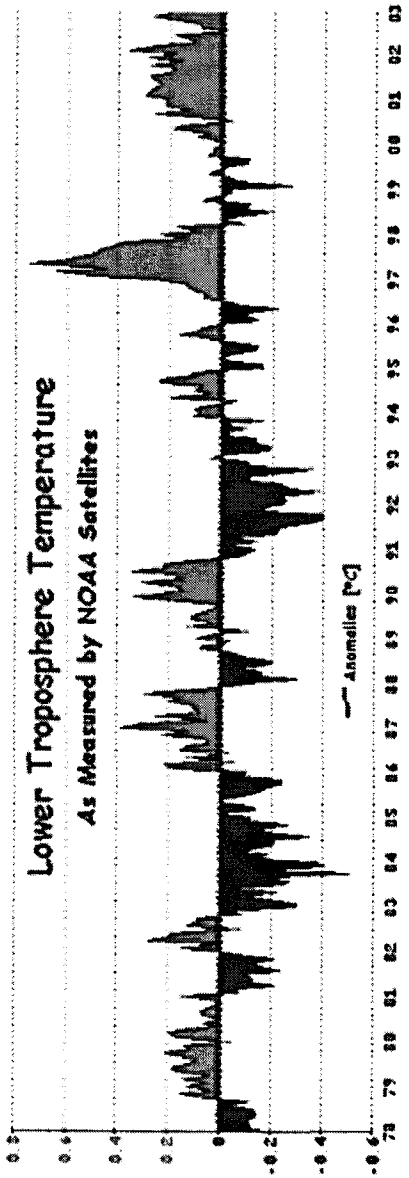

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Figure 8: Changing our Perspectives of Cis-Lunar Earth-Space

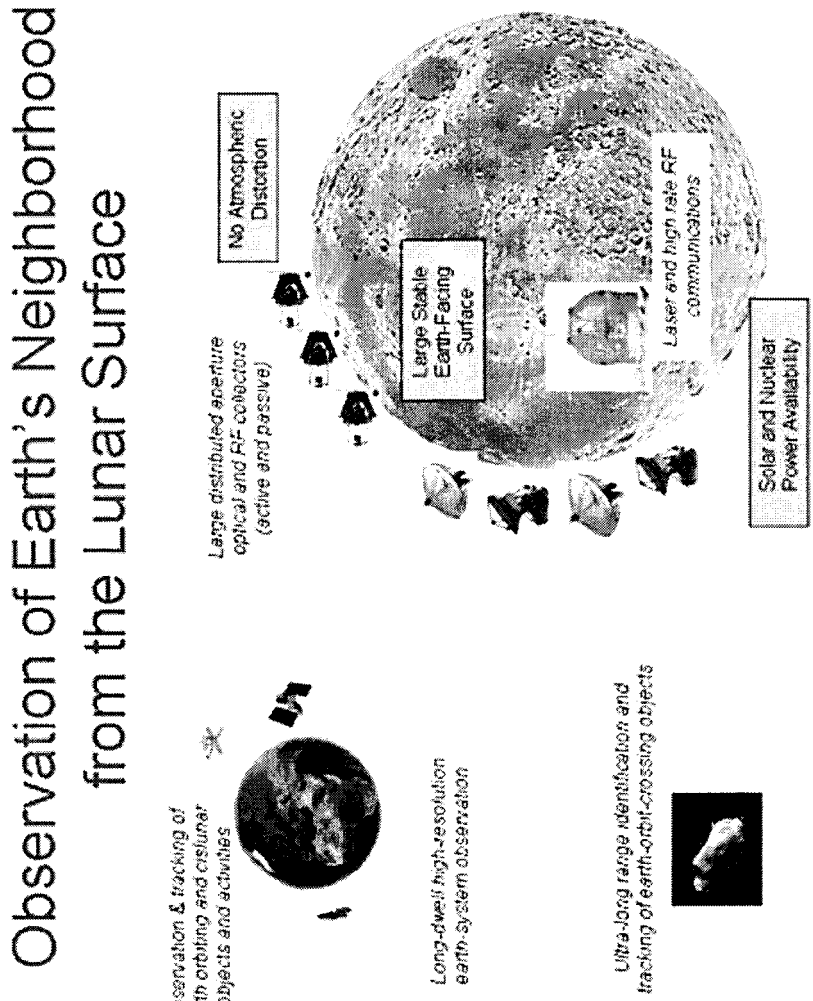

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Figure: 9 – 1969 Space Task Force
Lunar Astronomy Recommendations

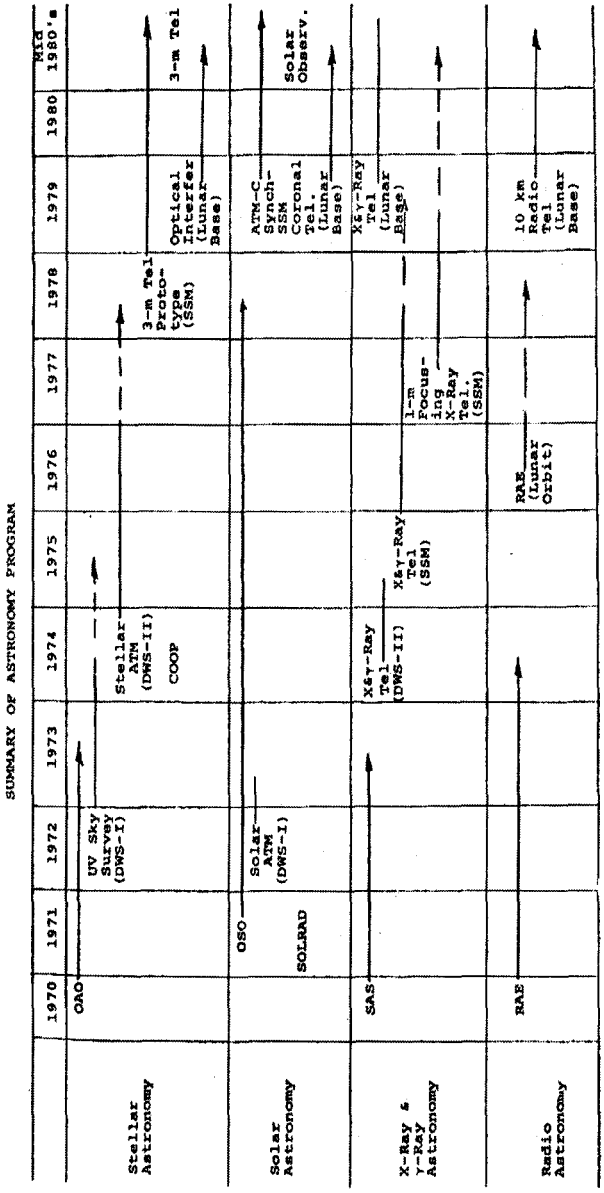

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Figure 10: One Far-Side Lunar Observatory

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Figure 11: Assembly of Large Structures in Cis-Lunar Space

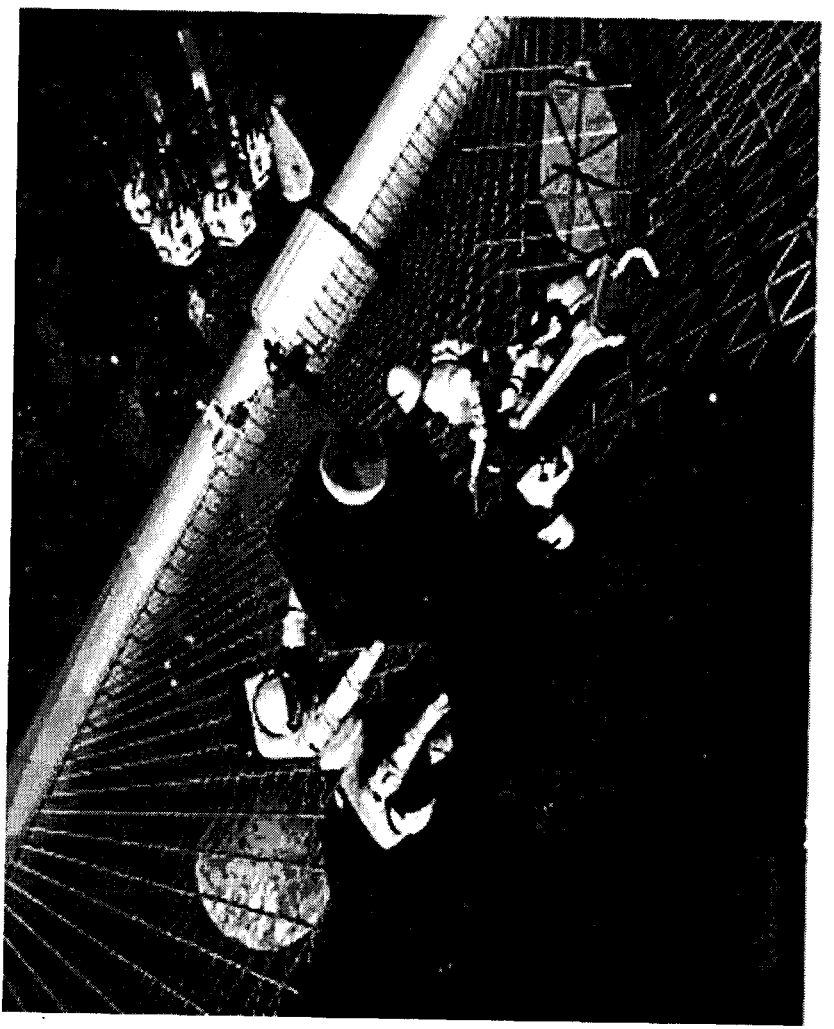

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Figure 12: Ultra Large Interferometer – Extra Solar Planetary Systems (250 km Diameter)

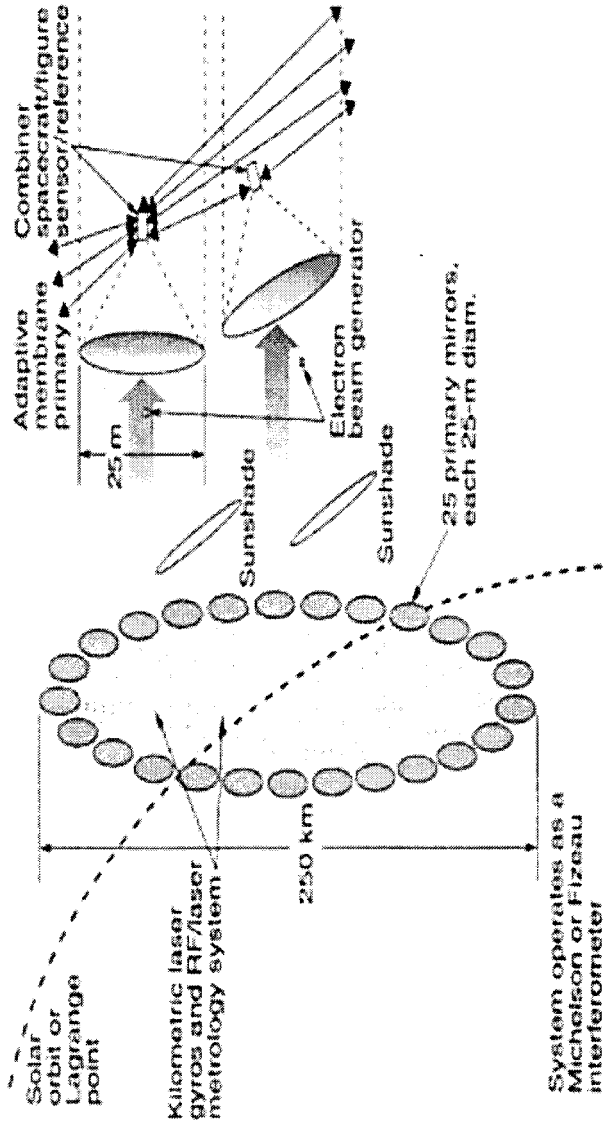

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Figure 13: Monte Carlo Simulations of Effects of Life Sciences Parameters on a Hypothetical Mars Sprint Mission

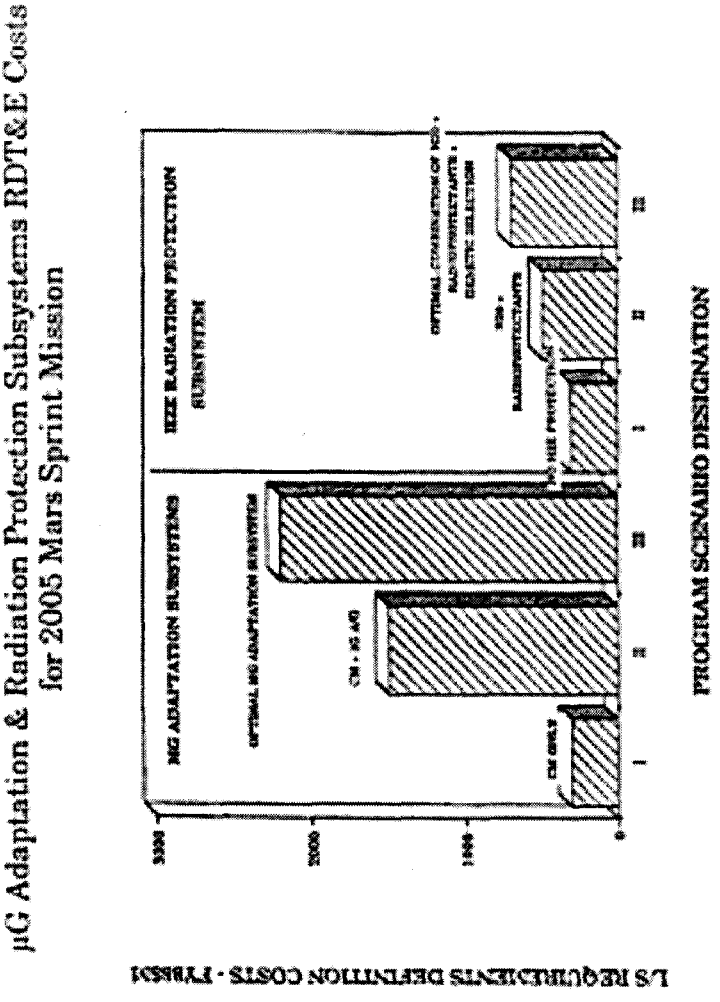

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Figure 14: Energy Distribution to Earth via Large Space Reflectors

#1 Solar Arrays, #2 Microwave Transmitters, #3 Reflectors all made from Lunar Soils by Equipment #4, #5 and #6 (Criswell)

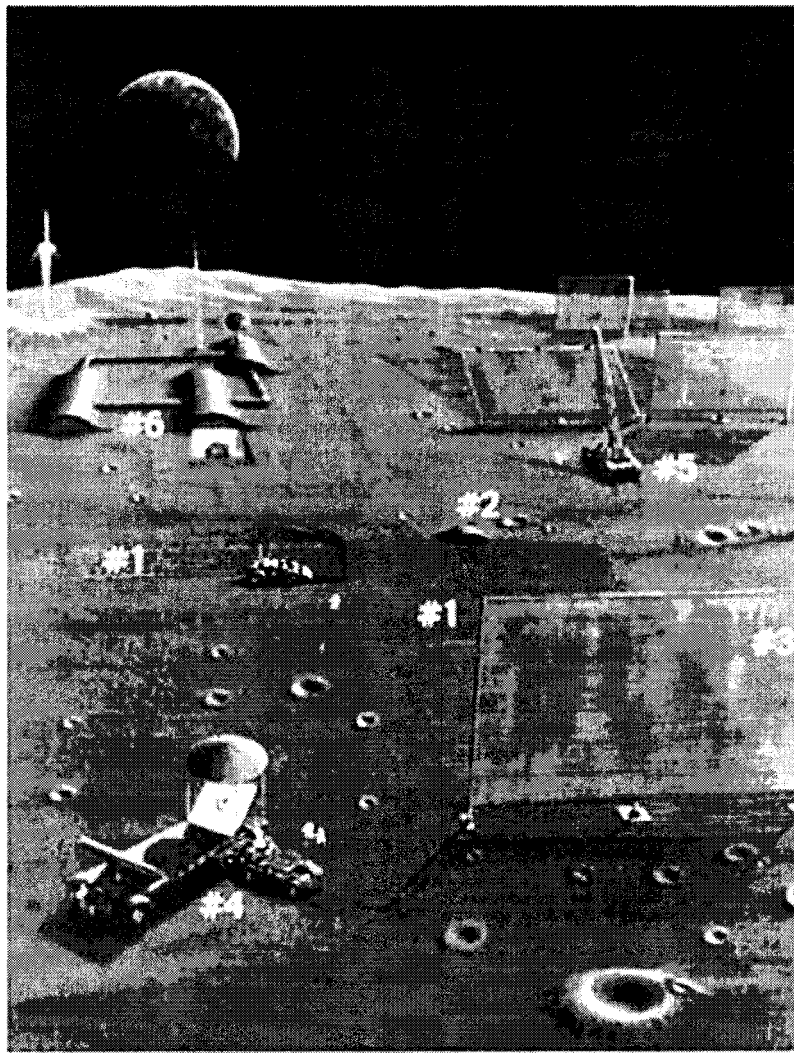

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Figure 15: By-Products of Helium 3 Production from Lunar Regolith

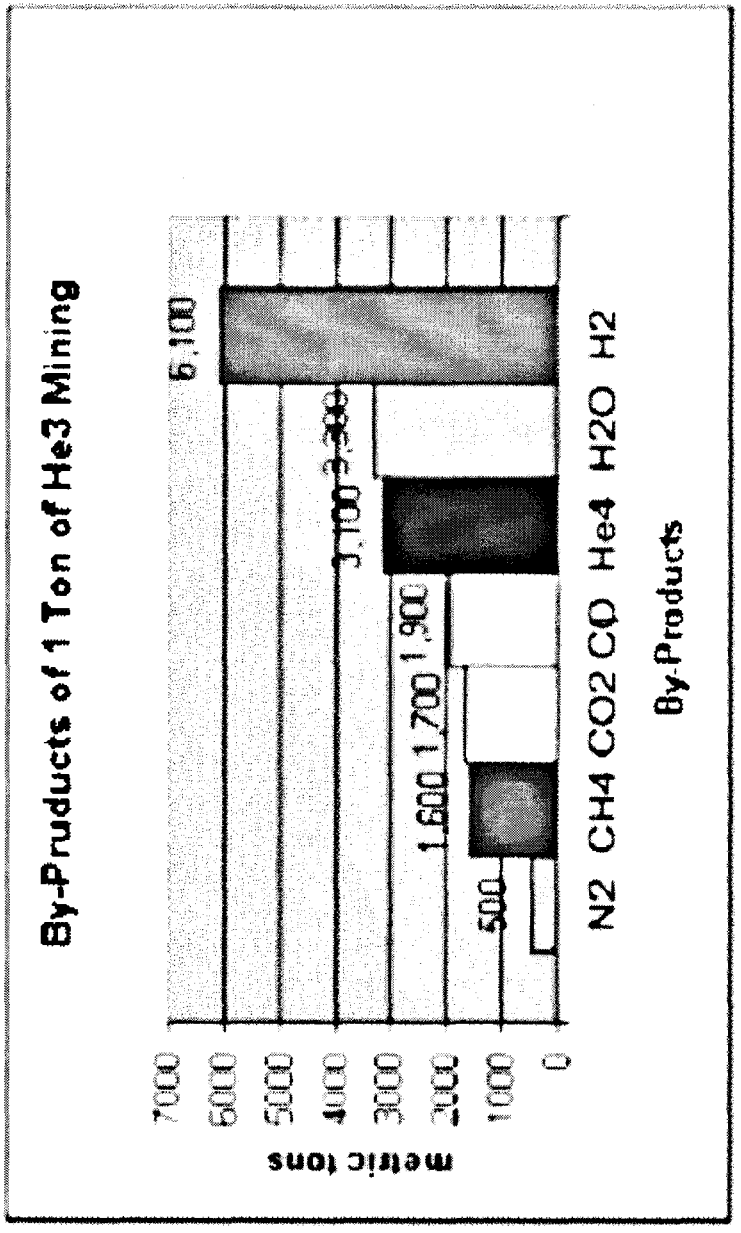

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Figure 16: Manufacture of Solar Power Satellites from Lunar Resources

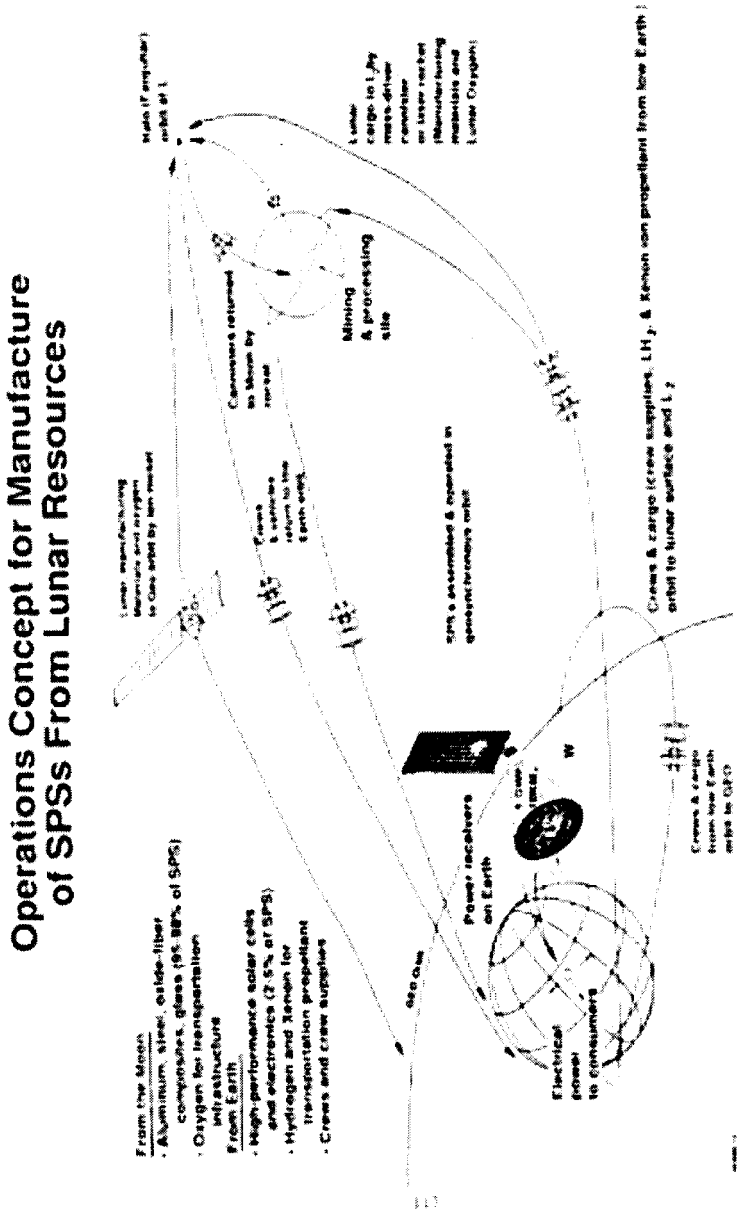

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Figure 17: First Space Sail, February 5, 1993, NPO Energia, Vladimir Syromiatnikov, Columbus 500 Entry

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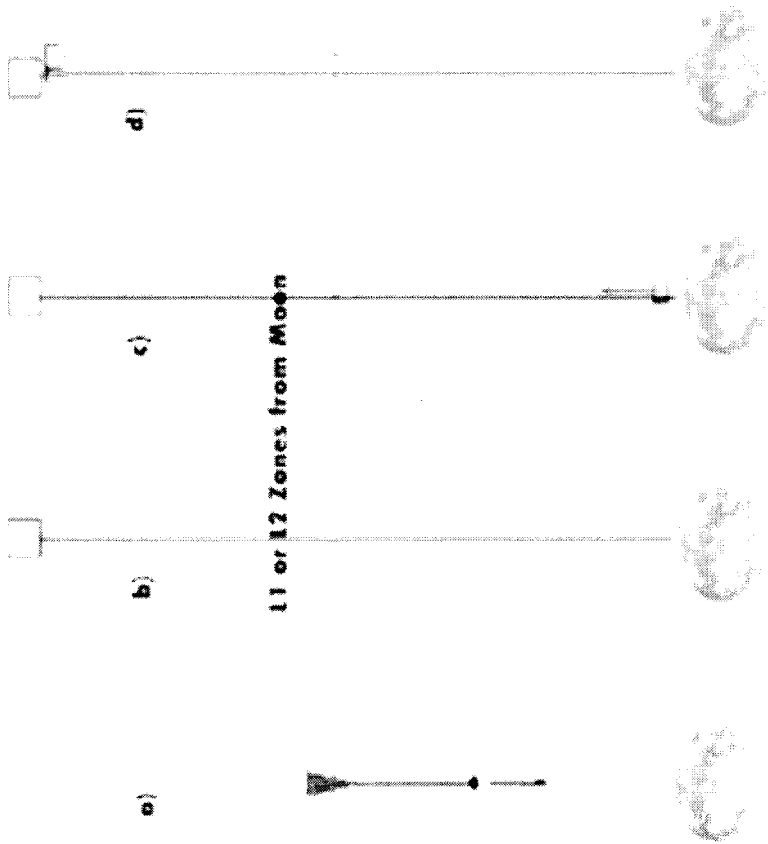
Figure 18: Illustration of the Deployment Scenario for Space



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Appendix:

The Economics of Space Enterprise
IAF Congress Innsbruck 1986

Klaus P. Heiss

"With the sharp instruments, they could recognize every detail on the Earth and could give light signals to the Earth through the use of appropriate mirrors. They would enable telegraphic connections with places to which neither cables nor electrical waves can reach. . . The station could observe every iceberg and could warn shipping. . . The disaster of the Titanic of 1912... could have been prevented in this way.

Hermann Oberth

Rockets to Planetary Spaces, 1923, NASA TT F-9227, pp 92-97.

Principles of Space Enterprise [1986].

The achievements in Space enterprise to-date are several, very significant contributions to the well being of all of us. Among the contributions I would list:

(1) The '**Global Awareness**' that we have today. Probably the single most important economic – and other – contribution Space has made is the image of the Earth rising above the moon. This has driven one message home: Earth is an extremely vulnerable "soap bubble" ready to "burst" at any moment. The fact that today indeed we have global discussions on the environment, the economies, on information, on military and national security issues, and in many other areas, I attribute foremost to that one image taken on the moon by man. What to us economists was but an abstract notion – the worldwide interdependence of economic systems in open world trade – was shown here in one simple picture. That one image to me, an economist, justifies the Space program and all the costs we sank into it to-date, and in years to come.

(2) The second major benefit of the Space program has been the **stability brought about in international strategic relations**, thanks to information gathered independently from Space by the major powers. I do not want to rewrite or reinvent history – others are much better at that. But the outbreak of wars, global wars, strategic wars in this century, can be attributed first and foremost to a lack of information, the uncertainty as to the intentions of the major adversaries, e.g. before World War I. The likelihood of any large scale, major strategic conflict for the rest of this century I claim is zero. The reason for this is Space and the information it provides: independent, verifiable information. That has been, and will

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continue to be the second largest benefit of Space for the United States and for mankind.

(3) Ranked third in terms of significance of benefits from Space activities are **global communications**. The world today is so radically different from the world of the 1950s because of instant, global Space communications: While other means of communications now exist, the fact that today we are a worldwide, instant information society is due largely to Space communications, and the commercial approach to Space communications at that. It is the only area where we chose the commercial route, with the creation of Comsat in 1962 and later Intelsat. Even the Soviet Union has now applied for membership in this most commercial of all international organizations.

The benefits of Space communications are "radical", widespread, and taken for granted today. But they are there nevertheless. I do not want to quantify these benefits for the moment. Others have done that, and I have done so elsewhere.

II. Constraints to Expanded Space Activities.

Yet, despite these vast benefits of Space today we are grounded, thanks to government failures and inactions. We cannot launch; if we had operational launch vehicles, we cannot get insurance; if we could get launchers and insurance, we cannot pursue Space observations, because of the 1984 Landsat Remote Sensing 'Commercialization Act', which **disallows private property rights to original Space data**, even if privately funded (Title 4 of that act).

And finally, if we did reach the Moon again, or any other celestial body, we could not take possession of the resources there, so why go to the Moon and beyond under the UN Outer Space Treaty?

From this I conclude that serious constraints have been imposed on the commercial and beneficial uses of Space and private enterprise. These constraints have to be removed. I will come back to these basic principles later.

In addition to these **statutory and bureaucratic constraints**, there are other, real economic constraints – i.e. costs – that hinder the full development of Space. These are:

(1) **Transportation Costs.** Space transportation costs are real, and they are high. The vision in the early 1970s of a fully reusable Space transportation system is still there to be fulfilled. Today we only have a partially reusable Space shuttle, once it is allowed to operate again. We never developed a reusable upper stage as recommended in 1972. We do not have a fully operational space transportation system. A Shuttle launch today still is an individually engineered, handcrafted event. We have to get from here to where we thought we would be getting in the early 1970s to achieve a low-cost, reusable space transportation capability.

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Radical advances may be possible in Space transportation, indeed are needed in the decades ahead, possibly based on some of the technology breakthroughs and advances envisioned in kinetic and directed energy technologies envisioned by the Strategic Defense Initiative. Laser propulsion may at some time in the future allow ISPs of 2000 or more and thereby bring about radically lower Space transportation costs. In the meantime, gravity does exist and we can not wish it away. Transportation costs will put a severe limit on Space enterprise – and on how far we ever will go in Space for economic benefits on Earth.

(2) **Interest.** Just as physicists cannot do away with gravity, economists can not do away with the cost of time – interest. This cost of time – or the cost of the use of capital – is a truly universal cost inherent to any civilization, wherever that civilization may be. While there may come the day of "anti-gravity" technologies speculated about in science fiction and advanced courses in theoretical physics, the cost of capital is an immutable fact – similar to the second law of thermodynamics. Any civilization has interest costs – there is a cost to time. The more innovative a civilization, the higher this cost. Interest is the "economic gravity well" out of which there is no escape, and which will limit very far flung uses of resources even within our solar system, and certainly beyond that. For example, going to Mars and back over a three year period in a $1 billion spacecraft with three astronauts will impose an interest cost of about $300 million, or $100 million per astronaut. This cost exists, whether it is explicitly paid for or whether it is born by taxpayers. One cannot do away with this cost, even if anti-gravity machines existed. As long as it takes time to go from here to there and back, interest costs exists and are a serious obstacle to the economic uses of resources that travel at less than the speed of light. (Two such commodities exist – information and solar energy – and these are discussed below).

(3) **Demand.** Demand is a "constraint" to the uses of Space resources on Earth. What I mean by that is that the Earth is abundant in most mineral resources. If we had today, say, a huge asteroid of pure platinum to be landed at Edwards Air Force Base, it certainly is not likely to have paid for the costs of the mission to capture and recover such an asteroid: the first, and probably only, thing that would happen is that the prospect of a successful landing of such a massive asteroid would lead to a total collapse of the platinum prize on the Chicago Commodities Exchange, down to about zero. The economics of the uses of lunar or other celestial mineral resources is seriously limited, even at zero transportation cost: demand for most commodities is at most "unit elastic", meaning that one spends about the same budget on that commodity, irrespective of price. That is true for wheat, for food crops, and it is also true for mineral resources. The 'Club of Rome' of the 1960s was wrong, the market was right. The world today is overabundant in resources. Anybody who doubts that should call the Chicago Commodities Exchange and ask what happened to the prices of

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resources – wheat, barley, oil, energy since the 1970s. To add abundance to abundance makes little sense.

III. Economic Benefits of Space Activities.

Given these serious constraints – and real costs – to Space enterprise, there are nevertheless also important, very basic benefits to such enterprise which amply justify our Space activities. Among the basic benefits I would list:

(1) **The Survival of Man**. As mentioned earlier, the images of Earth from Space, and of the inner and outer solar system, have shown that the solar system is an extremely violent place. Sitting ion this "soap bubble" Earth, mankind has a duty to get off Earth and learn how to live and sustain itself outside this Earth. I call this the true "Project Independence", or project survival. Mankind has to pursue manned Space flight. It is a historical, existentialist duty of our generation, and those to come. This exploration will take place with or without the United States. If we do not pursue manned Space exploration the Russians will, and the Japanese, and the Chinese, and of course the Europeans. We have no choice, even if we wanted to. But the United States will go out there again, and the reason for that is survival, ours and mankind's.

Related to survival and the need to go into Space is another factor: today, for the first time the world is "closed", i.e. the known Earth is a closed world for the first time in history. Columbus set out for the unknown. Others set out for the unknown, some as recently as the early part of this century. Even in the 1950s the atlases of the world contained "white spots" of unknown, unexplored territories. These spots have disappeared today, there are no "white spots" of unknown territories left on Earth today. I believe it is impossible for mankind to live in such a closed world for long – a zero sum world. We have to have open frontiers, the challenge of the unknown, which means we have to go into Space. These are not abstract notions; these are real, indeed the primary reasons for going into Space. The Space Station may not make much economic sense otherwise, but manned Space exploration is reason enough for this pursuit.

(2) **The High Ground of National Security**. For the past 25 years Space already has made significant contributions to the stability of strategic relations (see above). More importantly, we now do have the President's Strategic Defense Initiative (SDI), which holds the promise to liberate the United States and mankind from the unhealthy current situation of mutually assured destruction (MAD). MAD is a new, unhealthy condition of mankind. The moral equivalence it implies – in Europe and elsewhere – between the Soviet Union and the United States is obnoxious, to say the least. We have to get away from this confrontation, this nightmare, the currently very unstable "stability". SDI holds that promise. This indeed is a benefit of Space, and let us call SDI that.

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Now, beyond these basic benefits, possibly transcendental benefits to some, let me come to the more immediate, pecuniary, economic paybacks we may expect from Space in the decades to come. Given the above real constraints – leaving the issues of principles aside, these are transportation costs and the cost of time – there will be two major benefit areas from Space activities: information and energy. Both commodities can be transmitted at low added cost and essentially at the speed of light. Both commodities meet the principle cost obstacles to the uses of Space just listed.

(3) **The Information Economy.** The payback from Space in the next decades will not be from Space processing or from natural resource uses of Space on Earth as envisioned by some. The high cost of transport of these massive commodities alone will prevent such large scale uses. The one immediate area that has and will 'pay back' in multiples is Space based information-communications, remote sensing, worldwide data bases and information management. Today's economies are information economies. In the United States, of the $4 trillion or so of GNP, about $2 trillion can be related to informational activities: the garnering of information, the creation of information, the storage and distribution of information, passing on information from one generation to the next. Furthermore, and often overlooked, is the information content of products: an airplane today – in terms of manpower and materials expended on its design and construction – is mostly "information": CAD/CAM, avionics systems, fly by wire technologies, air-traffic control systems, scheduling and operations of the aircraft etc. This is true for many other products as well.

Communications satellites of today are just the beginning. Let me give you a vision: we have today the capability to commit the US to putting all the information contained in the Library of Congress "into orbit" and make this information accessible to all mankind worldwide through small, portable terminals, without any intervening controls or ground based network 'interfaces'. This would require two or three large platforms in geo-synchronous orbit. The Library of Congress comprises about 80 trillion bits of data in all the books and documents stored there.

Such "Information Platforms" will be the end of the control of information, the control of societies, where governments often deny access to information to their own people. Such "Information Platforms" are in my mind among the most revolutionary, new frontiers, that still remain to be conquered. Such "Information Platforms would also go a long way to assure the "survival" of man's knowledge, should indeed a major nuclear war ever destroy the main repositories of man's knowledge today, which are few indeed.

Instead of pursuing such ideas and technologies, we have cut back – indeed eliminated – any NASA communications R&D.

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(4) **Energy**. The other major payback from Space – not in the next decade, but certainly in the next century – will be the collection of solar energy in Space and its transmission to Earth to provide for mankind's energy needs. The reason for this, once more, is that energy once garnered can be transmitted at low additional cost and essentially at the speed of light, the two necessary attributes for any large scale economic uses of Space. And again we have managed to terminate all R&D into this potential in the United States: I was a member of the National Research Council committee that concluded that the US should not even do research on the Solar Power Satellite (SPS). Tom Paine and I dissented, but that did not change the conclusion of that illustrious committee.

Let me just briefly sketch out for you this potential. The "disk" described by the Earth in Space has incident solar energy at one AU and over ten days equivalent to the TOTAL KNOWN AND SPECULATED fossil fuel resources accumulated on Earth over millions and millions of years. Again, all this energy is equivalent to but ten days of solar energy that passes through a circle with about 5,000 miles in diameter.

If one were to put such a disk closer to the Sun, say at the distance of Mercury, that energy equivalent disk would "shrink" to 3,200 miles, roughly the distance from Bar Harbor, Maine, to San Diego, California, with a total area equivalent to that of the Soviet Union. In one day more energy passes through that disk than the energy needed by all mankind to put it on the same per capita energy availability as that enjoyed by Europe.

Instead today we have an insurmountable contradiction: we say that we want all mankind to have "our" standard of living, i.e. 5 billion people. At the average European energy consumption, i.e. much less than in the United States, that would mean 40 billion tons of coal equivalent energy consumption per year. Nobody can do that on Earth, even if the fossil resources were available, which of course they are not. And even if they were available, the environment would not allow such use.

IV. Space and the Developing Countries.

With the above observations it becomes self-evident that Space holds a particularly important role for developing nations. It should be obvious by now that many 'tenets' held by so-called development experts of the past few decades – geared toward the export of industrial goods from industrial countries at great expense to the developing countries – was a mistaken notion. Just as some of us always have maintained that the real promise for developing countries was a market oriented development approach – so it is with Space and Space applications today: the foremost need and opportunity of developing countries lies in the full and rapid development of advanced, modern Space-based information technology systems. Rather than try to insulate themselves from the worldwide, rapid information revolution and information flow, developing countries have to insist on an open market access to these technologies and their

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uses. Countries that insulate themselves from this information flow do so only at great harm to themselves.

In addition to the vast information benefits, developing nations must recognize the development of Space as a source of energy: all the promises and hopes held by 4 out of the 5 billion people living today in developing regions will come to naught if mankind does not find a practically inexhaustible, clean, safe and hopefully affordable energy source. Fusion energy may never be such a source, if only for the high degree of contamination. Nuclear fission energy could be an interim solution, but issues of non-proliferation seem to hinder a worldwide reliance on such energy supplies. This leaves Space-based, solar energy supplies even for use down here on Earth as the only realistic, long-term hope for such an energy source. Vast strides are being made in the Space technology areas that bear directly on making the vision of Space-based power supplies a likely promise for the 21st century.

The other option would be the massive use of nuclear energy worldwide, a prospect disturbing to many.

V. The Need for Free Market Principles in Space.

These are the broad potentials for payback from Space that largely still lie ahead to be realized. But before we will see a large scale expansion in the economic uses of Space – which can only come about through private enterprise (see Space communications to-date) we have to revisit and change the ground rules that govern Space activities.

Today we have outlawed private property in Space with the 1967 Outer Space Treaty. How the United States – of all countries – did so is beyond me, only five years after setting an enlightened precedent with the creation of Comsat in 1962.

We now have also outlawed proprietary data rights to original Space data with the so-called Landsat Remote Sensing Commercialization Act, an Act in fundamental violation of the First Amendment of the US constitution, in that it requires a government license before one can operate a television camera in Space.

If we want to go into Space we cannot do so today without a host of government approvals, consents and other unwarranted and unnecessary requirements artificially imposed to assure government control of these activities. We have to re-establish in Space the same principles that govern our activities on Earth and which make the United States and other free market societies so dynamic and great. Private property rights to any and all mineral resources, private property rights any and all lands, private property rights to any data gathered in Space and from Space, private property rights to all intellectual knowledge developed in the pursuit of Space enterprise.

Unless we do so, if we simply dispense with free enterprise and the freedoms known to some on Earth as soon as we lift off from a launch pad to enter Space as a region governed by totalitarian principles so contradictory to the values we hold on Earth, I do not see any economic or other reason for us to go

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into Space, whether privately funded or at taxpayers' expense. We have to change the ground rules and establish in Space the same principles that govern successful and democratic societies on Earth, all of which are based an private property, risk and gain. If that means abolishing the 1967 Outer Space Treaty, so be it. Why should we advocate and defend a treaty that is contrary to our fundamental, constitutional principles? The ultimate payback from Space are profits, and profits gained from Space enterprise will be the ultimate benefits for mankind. That is why it is important that we go back and re-establish the fundamental principles of free enterprise, so indeed all of us can and will benefit from Space, industrial as well as developing countries, and most important, all the people, not just the select few government and industry representatives who already have made Space a very enjoyable activity here on Earth with conferences as this one here in Innsbruck, Tyrol, the country where free men never owed allegiance to anyone, where serfdom was never known.

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Thaksinomics: A New Asian Paradigm?

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The Thai economy has performed extremely well in recent years. What is especially interesting is the unique set of economic policies implemented during this period of accelerated growth. Often dubbed "Thaksinomics," these policies represent a distinct break from the past. To Prime Minister Thaksin's followers the new economic measures are not only capable of returning Thailand to the pre-1997 glory days of high growth, but perhaps even more importantly, enabling the country to successfully coexist economically with China.

Key Words: Thailand; Asian Economic Crisis; Thaksin; Thaksinomics; East Asian Economic Model (EAEM); Dual Track Development Model; Globalization; Hernando de Soto; Small- and Medium-Sized Enterprises (SMEs); Washington Consensus; Rural development; Terrorism; APEC; Total factor productivity (TFP); Foreign Direct Investment (FDI).

We must accept that the global economic landscape in the new millennium is much different than in preceding decades.

Thaksin Shinawatra, Prime Minister of Thailand

Introduction

Prior to the Asian Economic Crisis sparked by the collapse of the Thai baht in 1997, Southeast Asia looked like a sure bet for a long period of high, sustained economic growth. Its membership in the elite group of industrialized countries seemed assured. The crisis came as a complete surprise to many area experts, and brought an end to the era of the "Asian Miracle." While growth rates are gradually edging upwards, the region has not been able to restore the pre-crisis mechanisms that propelled many of its countries out of poverty and into near affluence.

As a region, Southeast Asia's economies are the most open to international trade. While such openness spurred their growth for several decades, in the post-1997 period it has left them increasingly vulnerable

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to adverse economic and political shocks. The region suffered a tremendous blow to its technology exports when the 2001-02 recession spread to the region following the collapse in America's information technology investment. Increasing competition with China for foreign investment and export markets is also making it harder for Southeast Asian economies to sustain growth rates approaching those attained in the pre-1997 period.

Compounding the region's economic woes was the powerful Bali terrorist attack and its impact on tourism. U.S. and other Western intelligence sources have confirmed the presence of powerful terrorist networks throughout the region – Indonesia, Malaysia, Singapore, Thailand and Philippines. The openness of these economies makes them especially vulnerable to terrorist acts.

Despite these challenges, the Thai economy began accelerating from a growth rate of 1.9 percent in 2001 (the year Dr. Thaksin was elected Prime Minister) to 5.3 percent in 2002, to a projected 6.5 percent in 2003, with forecasts of even higher rates in the next several years.[1] Compared with the Thailand that went hat in hand to the IMF in 1997, Thailand today is a nation transformed: in addition to its impressive growth, its foreign debt has dropped by two-thirds, and the stock market soared 69 percent during the first three-quarters of 2003.[2]

Thailand has built on its recent economic successes to quickly become one of the United States' most valued allies in Asia. The country has cooperated closely with the United States in regional counterterrorism operations and, unlike many nations, has actually made good on its pledges to send troops to Iraq as well as Afghanistan.[3] The payoff is sure to be substantial, as evidenced by the United States' recent designation of Thailand as a major non-NATO ally[4], and the beginning of negotiations for a free trade agreement between the two countries.[5]

Finally, the country's recent economic success has in the eyes of many observers[6] elevated Prime Minister Thaksin Shinawatra to the status of likely successor to fill the void left as Malaysian Prime Minister Mahathir Mohamad steps down as head of APEC (Asia-Pacific Economic Cooperation).[7] Clearly, under Thaksin Thailand is becoming one of the pivotal states in Southeast Asia.[8]

What is especially interesting about Thailand is the unique set of

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economic policies implemented during this period of accelerated growth. Often dubbed "Thaksinomics," these policies represent a distinct break from the past. To Thaksin's followers the new economic measures are not only capable of returning Thailand to the pre-1997 glory days of high growth, but perhaps even more importantly, enabling the country to successfully coexist economically with China, while, at the same time, making Thailand a less fertile ground for terrorism.

This essay examines the phenomenon of Thaksinomics. What does it replace? What are its main assumptions? The key policies and programs implemented to date? The likelihood of its success?

Origins of Thaksinomics

To its defenders[9] Thaksinomics is a pragmatic response[10] to the void created by the demise of two key paradigms that formed the basis of much of the pre-1997 economic policy-making in East Asia: the Washington Consensus, to a certain extent a set of policies imposed from outside the region, and the East Asia Economic Model (EAEM). A somewhat related factor, the observed decline in productivity in the 1990s, no doubt also played a significant role in the development of Thaksinomics.

Demise of The Washington Consensus

Before the Asia crisis in 1997, most technocrats and businessmen in Thailand believed that the country's economy should be relatively open. This openness provides access to technology and capital. Technocrats had long believed that increasing openness was needed to force Thai companies to become more efficient and to break down old monopolies. Hence liberalization and privatization had been staples of economic policy since the mid-1980s.[11]

The 1997 Asian crisis brought this view into question, along with a number of related conventional wisdoms of the time, the most notable being the so-called Washington Consensus, an agreement of outlook among the multilateral agencies in Washington – the World Bank and the International Monetary Fund (IMF) – on a set of free market policies that formed the basis for the conditions under which those agencies lent to developing countries.

Under the Consensus, countries were encouraged to promote liber-

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alization by reducing barriers against imports with a view to eventually achieving free trade. Privatization of state owned enterprises and financial deregulation were also key elements in Washington Consensus policies. In short, governments were expected to withdraw from economic activity and intervene as little as possible. Free market prices were seen as the most important factor in promoting successful development.

In the 1990s these policies began to be questioned, not only by academic writers but also by the World Bank itself. The double-digit annual Gross Domestic Product (GDP) growth in China since the start of its economic reform program in 1978 has not been achieved by universal free markets, free trade or widespread privatizations. The Chinese experience suggested that the state can promote development by intervention in the economy. Looking back on the Asian Crisis it is also apparent that its cause was not the result of too much government intervention, but of too little – a failure to regulate financial markets. Pasuk and Baker's[12] analysis of the 1997 Thai crisis goes even further, arguing that the transformation of Thai institutional structures to conform to the mandates of the Washington Consensus on limited state economic intervention are precisely what caused the crisis.

Increasingly, throughout Asia a post-Washington Consensus outlook is emerging which stresses that markets can fail – especially financial markets and markets for technology – and that governments should intervene to promote domestic competition, regulate financial transactions, promote education and stimulate the inward transfer of technology.[13] This particular view of government intervention has become one of the key elements of Thaksinomics.

Limitations of the East Asia Economic Model (EAEM)

As its name suggests, the EAEM is a development strategy somewhat unique to Asia. The strategy is built around two key features: (a) high investment rates stemming mainly from foreign direct investment (FDI), and (b) an outward orientation emphasizing labor intensive manufactured exports. Multinational corporations often play a dominant role in both aspects – supplying FDI and mass-producing goods for the export market. In practice, it is the development model followed by the

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majority of Asia/Pacific countries, including Thailand, since the late 1970s and early 1980s.

Imbalances created over time by the implementation of the EAEM have undermined its effectiveness in generating high and sustained rates of growth. For example, Lian[14] notes that the common pattern is for the Asia/Pacific region's terms of trade to worsen nearly every time global demand for electronics, agricultural products or primary commodities declines sharply.

> [The] Asia/Pacific region's pursuit of the EAEM directly contributes to global imbalances and negatively affects the performance of Asian companies as well as the standard of living of the region's workers and households. The logic is simple, in our view, excess saving exacerbates the global savings imbalance that in turn necessitates imbalances in trade; in turn the nature of trade and production subjects the region to a vicious cycle of price wars and worsening terms of trade.[15]

Breaking this vicious cycle of price wars is another key component of Thaksinomics. Here it should also be noted that even in the hey-day of the EAEM, Thailand's openness[16] relative to other countries, while high, began declining in the early 1990s (Figure 1), suggesting that the EAEM model was encountering diminishing returns in terms of integrating the country into the world economy.

It is also not clear that the EAEM model was enabling Thailand to utilize its resources in the most efficient manner. In his analysis, Porter[17] found a strong relationship between his Microeconomic Competitiveness Index (MCI) and per capita income, with over 81 percent of the differences in country per capita incomes accounted for by the index. However, Thailand's per capita income is considerably lower than one would anticipate, given the country's MCI. In this sense the Thai economy was clearly underperforming in the early 2000 period. Korea, Malaysia, China and Indonesia also fell in the under-performer group, while, given their MCI scores, Singapore and Taiwan's per capita incomes were in line with what one might expect. Hong Kong was the only country in the region classified as an over-achiever – incapable of sustaining its per capita income with no improvement in its microeconomic fundamentals.

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Adverse Trends in Total Factor Productivity

In part, the increasing limitations on growth imposed by the EAEM manifest themselves in the observed trends in the country's total factor productivity (TFP). TFP measures the efficiency of a given set of input factors, capital and labor in generating output. Alternatively it can be thought of as the level of technological development in the economy – a given amount of factor input will generate more or less output depending on the country's technological capacity. TFP is a critical variable for sustaining long-term growth because unlike increments of capital and labor it is not subject to diminishing returns.

In its assessment of the trends of TFP in Thailand, the IMF[18] found that the high rates of growth in the pre-1997 period were driven by capital accumulation, rather than TFP growth. Even more significantly, IMF estimates show that TFP growth slowed during the 1990s. This finding is similar to that of other researchers (Table 1).

These patterns no doubt account for the fact that in terms of the overall competitiveness of its products, Thailand lags behind several of its East Asian competitors: Singapore, Hong Kong, Taiwan, Korea and Malaysia, with China quickly closing the gap (Table 2). It should be noted that Thailand did improve its competitiveness during the first two years (2001-02) of the Thaksin administration.

Given likely demographic and investment patterns in the country, the IMF concluded that medium-term economic growth in Thailand will have to be driven by TFP growth rather than accumulation of capital and labor. This shift in the country's growth mechanism represents a sharp contrast with the pre-1997 growth pattern driven largely by capital accumulation.

The need for TFP-led output growth underscores the importance of maintaining an environment that is conducive to efficiency gains and technological development. It is in this light that Thaksinomics will be examined below – is this new approach to development in Thailand likely to succeed in creating the necessary conditions for expanded productivity and growth?

The Core Elements of Thaksinomics

Like Reaganomics in the 1980s, Thaksinomics is controversial. It is

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an eclectic strategy that combines the traditional element of the EAEM model, emphasizing mass manufacturing spearheaded by foreign direct investment – dubbed the First Track – and a more domestic focus on local enterprises leveraging indigenous skills and resources, known as the Second Track. A distinctive feature of Thaksinomics is the emphasis given the Second Track.

As in the past, the First Track is oriented towards creating relatively high paying jobs and earning foreign exchange. The Second Track on the other hand focuses on activities that will not come into direct competition with China. A major goal of Thaksinomics is to pursue both goals in a manner that gradually shifts the Thai economy from export dependence to greater reliance on the more controllable domestic market. Thaksin envisions this process increasing domestic consumption to 60% of Gross Domestic Product (GDP) from the current level of 55%. Simultaneously the goal is to reduce exports as a proportion of GDP from 60% to 50%.

The rationale for the two track strategy is straightforward: most developed countries have a smaller proportion of exports to GDP than do the East Asian economies. Therefore, they are less vulnerable to external shocks like the terrorism incident in Bali, the SARS epidemic, or a slowdown of the U.S. economy.

The idea is to stimulate domestic demand in the short run through increased government expenditures, while simultaneously searching for new local industries to develop as part of the diversification away from EAEM activities. At the same time, domestic market focused policies can achieve structural change by assisting business in moving up the value added chain, thus keeping ahead of direct Chinese competition.

While it might appear that Thaksinomics represents a retreat from globalization, this is not the case. Although the policies are more domestically focused, they are not meant to discriminate against foreign capital. In fact Thailand is still aggressively attempting to attract foreign direct investment (FDI).

Implementation – First Stage

Implementation of Thaksinomics has evolved through various stages. One of the key elements in Thaksinomics is the focus on poverty

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alleviation, especially in rural areas. Initial policies were geared toward providing small fiscal doses aimed at reviving rural demand and creating housing demand for low-wage government workers, rejuvenating underdeveloped resources and indigenous skill-rich small and medium sized enterprises (SMEs) with good growth potential. Another key element was assisting under-leveraged households to achieve higher levels of consumption. Implementation has occurred through a variety of unique projects. The most urgent policies that the Thaksin government initially implemented were those aimed at empowering the grassroots.

Farm Assistance

The first programs were focused on the agricultural sector, starting with a three-year moratorium on farmers' debt payments to the Bank for Agriculture and Agricultural Cooperatives (BBAC). This was the initial step in reforming the debt structure and maturity profile of the agricultural sector to match the crop production cycle. At the same time, the government is attempting to upgrade land rights to be used as bank collateral.

Urban Relief

The urban poor also benefit from incentives brought about by the government. Small loans for street-side vendors are provided through the Government Savings Bank (GSB). The GSB provided individuals loans worth 30,000 baht each for a total of 10 billion baht in 2002.

Retired Civil Servants

A special spending package was also set up for retired civil servants. Under this program the government will pay an amount equivalent to 30 times salary to the families of civil servants who pass away. A new ruling permits retired civil servants to spend half of that amount before their death. It is estimated that the total amount of spending power created from this initiative would be roughly 45 billion baht.

To boost grassroots access to financing, the Thaksin administration set up a number of new institutions:

The Village Fund

The first was the Village and Urban Revolving Fund. To many, Dr.

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Thaksin's election campaign pledge to provide 1 million baht ($24,000) to each of Thailand's 70,000 villages was a populist handout, but it is actually a revolving loan program. The program is unique in that it specifically targets projects aimed at stimulating the rural economy. Village leaders and bankers will identify projects and provide loans at 4% interest (commercial farm loans cost 5%-8%) to be guaranteed by community groups. The intent of the $1.6 billion Fund is to enable farmers to increase productivity, and value added, through developing new activities such as processing and packaging. The Fund can also be drawn on by individuals, households or groups to start their own small or micro-enterprises.

The People's Bank

This newly created bank is another grassroots credit facility set up to provide credit to micro-enterprises. In addition to providing financing to groups without access to the formal banking system, the goal of the Bank is also to promote entrepreneurship among the poor and the small traditional producers in villages.

The Bank for Small- and Medium-Sized Enterprises (SMEs)

SMEs play a critical role in Thaksinomics and the Bank for Small- and Medium Sized Enterprises is the financial component of the Government's overall SME promotion program. SMEs account for 40-50 percent of the Thai economy's GDP, 38 percent of the total value of exports and 69 percent of the country's jobs. Thaksinomics singles out SMEs because of their potential to adjust to fast changing conditions, to reach certain market niches more rapidly than bigger companies and to innovate in terms of products and process.

One Tambon Project

This program is nationwide, covering nearly all of Thailand's 7,252 districts. One Tambon is predicated on the idea that every Thai tambon (sub-district) has a variety of specialized local products. The key assumption of the project is that each community has a comparative advantage in one or more of these traditional products. The project's role is to assist the communities in modernizing the production and distribution process of these products so that they can be competitive at

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the national and international levels. The government's role is to identify candidate products and then to assist their development through providing necessary support for their eventual success.

The program is clearly intended to find new niches in foreign markets and develop new winners that will provide an alternative to the foreign direct investment-based and mass produced exports products that the country has been fast losing to China and other countries in the region with cheaper labor.

Other programs introduced during this period include:

- Housing projects for state workers and the low income masses introduced in 2001 and 2002, respectively;
- Various small and medium sized enterprise (SME) development initiatives introduced since 2001; and
- The comprehensive State-Enterprise Privatization Program started in 2001.

Clearly, it is a early to critically evaluate these initial attempts. However it is safe to say that these programs, along with some of the government's other fiscal activities have contributed to terminating asset deflation, reviving domestic demand and bringing about positive asset demand and asset price expectations.[19]

In addition there are some encouraging results stemming from the One Tambon project. Government figures put total sales of village enterprises under the program at $558 million in 2002, with an average profit margin of 26 percent. Their products are also finding their way to the shelves of luxury shops in Japan, the United States and Europe, thus enabling the village producers to earn four or five times more on each item than when sold in the local market.

Implementation – Second Stage

The second stage of Thaksinomics is intended to build on the first. In large part this is a more innovative, albeit controversial, stage.

The Capital Creation Scheme

Tentatively scheduled to start in December 2003, the Thai government plans on introducing a new program to redefine or reclassify assets so that they carry the underlying legal rights or documentation necessary

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for collateralized bank loans. The program has an ambitious agenda including the reclassification of land assets, intellectual-property assets, machinery assets, public pavement and stalls assets and rental-right assets. The basic idea is to legalize different assets so that the owners can use them fully to get access to capital. This should be of particular benefit to poor or low income earners.

The basic idea underlying this program is not new, but is one that has been advocated for years by Peruvian economist Hernando de Soto.[20] What de Soto has found is that most people in developing nations hold defective forms of assets such as properties and stalls that lack the documentation or legal status that gives them access to capital. Because the right to these possessions is not adequately documented, these assets cannot readily be turned into capital, cannot be traded outside the narrow local circles where people know and trust each other, and cannot be used for collateral for a loan. Apparently, the government aims to have the state-owned banks make available some 200 billion baht to support the next wave of loans arising from this asset-reclassification scheme.[21]

The question is whether this program will further help low income people or saddle them with more debt; and whether the program will have adverse financial consequences to the country in the long term. Will it jump-start a large segment of the economy, formerly marginalized, or will it simply create a new round of non performing loans? If de Soto's examples from Peru and other countries are any indication, the project should be highly successful.

By one estimate[22] the Capital Creation Scheme in the next 6-7 years could convert at least US$10 billion of dead capital into pledgible capital and transfer US$10-15 billion worth of underground economy activities into the real economy.

Grand Project Schemes

In a break from grassroots-type projects and programs, the Thai government has been proposing a number of grand projects designed to create new regional centers of economic activity:[23]

- In January 2003 for example Thaksin announced a 28 billion baht ($650 million) plan to make the northern city of Chaing Mai an

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international aviation hub. The initiative aims to upgrade airport facilities and capacity to promote Chiang Mai as an alternative site to Bangkok for foreign trade and investment.

- Also in January 2003 Thaksin unveiled a 100 billion baht plan to transform the resort island of Pyhuket into a laboratory for high-tech research and development. The software industry is one of several export businesses the authorities hope will be centered here.
- In another major initiative, the government has recently resurrected centuries-old plans for cutting a canal through Thailand to shorten shipping routes between Europe and East Asia. The proposed project, including construction of two harbors, a monorail and a highway across the Isthmus of Kra would cost around $35 billion.

While the EAEM model cannot serve as the sole basis for future growth, it's not clear that massive expenditures of this nature will necessarily come up with new services in which the country has a clear comparative advantage.

The Vayupak Mutual Fund Initiative

While the Capital Creation Scheme is aimed chiefly at reviving dead capital in the rural sector, a complementary new initiative, the Vayupak (named after a mythical bird that sometimes lays a golden egg – but other legends depict the avian creature as half-demon[24]) introduced late in 2003 is focused on monetizing the dead capital held by the government. Estimates are that this initiative[25] has the potential to mobilize an additional several billion $US worth of excess liquidity from the banking system. In all, it could add US$7-8 billion or an additional 10% of the market capitalization of Thailand.

Assessment

Dr. Thaksin Shinawatra was elected Prime Minister of Thailand through one of the biggest electoral victories in Thai history. His dramatic victory can be largely attributed to his vision for the Thai people. He was able to articulate a coherent economic program that was a distinct break from the malaise that had set in after the 1997 crisis. His

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innovative approach focused on empowering the grassroots population, giving them command over resources and enabling them to become active participants in the overall development of the country.

As implemented, Thaksin's program is difficult to characterize – and in this sense it is much easier to say what it isn't: it is definitely not pure populism as many have labeled it. Certainly it is not the populism practiced by Alan Garcia[26] in Peru in the 1980s. Nor does it resemble many of the quasi-populist heterodox-incomes policy alternative IMF programs introduced in Latin America.[27] It is non-confrontational, so it does not fall into the non-market solution programs often advocated by the South in the North-South New International Economic Order (NIEO).[28]

On the theoretical level, Thaksin's program combines elements of demand management (Keynesianism), supply side incentives[29] (Reaganomics), entrepreneurial development (Schumpeterism[30]), grassroots empowerment (de Sotoism) and the structuralist – non-price system reorienting – state led growth of Albert Hirschman.[31] It embraces globalization and comparative advantage, while at the same time attempting to shape the country's comparative advantage through non-price incentives.

Because of these varied themes the program can only be dubbed Thaksinomics – a unique and complex approach to the challenges posed by globalization in general and the rise of China in particular.

While it is premature to gauge the eventual success or failure of Thaksinomics, the program does appear to be off to a good start. The next several years are critical for the program's implementation and the following considerations will weigh heavily in determining the ultimate success or failure of Thaksinomics:

1. Diagnosis of economic situation. Thaksinomics directly addresses the limitations of the EAEM and the Washington Consensus. It also is oriented toward solutions to the two key challenges facing the Thai economy: the rise of Chinese exports and investment competition, and the slowdown of the economy's productivity in the 1990s. To date, it appears to be based on a correct diagnosis of the economic problems facing the country. The major problems encountered will be likely

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caused by implementation difficulties rather than conceptual limitations.

2. Medium-term performance. The recent surge in growth may simply be more utilization of capacity stemming from a Keynesian fiscal stimulus. The true test will come when the economy reaches full capacity. Will the country be able to achieve a high sustainable growth rate generated on the supply side through total factor productivity increases? Given China's closing of the competitiveness gap (Table 2) progress in this area will be the major determining factor in the ultimate success or failure of Thaksinomics.

3. Over-correction on consumption. Managed asset reflation through consumption stimulation was the correct policy response (2001-2003) to the lingering fall-out of the 1997 crisis. However, as the economy moves into the medium-term (2004-08), the government must be careful that a movement toward consumption and away from the EAEM investment led model does not reduce investment to the point that productivity gains are jeopardized.[32]

4. Macroeconomic management in the medium-term. In this regard, the proper balancing of aggregate consumption-led demand and investment-led supply into the medium term may prove to be the most challenging task facing Thaksin's management team.

5. Industrial policy, as applied in the One Tambon Project, has not been carried out very successfully, even in countries like Japan. In other countries, the main difficulties have involved objectivity, with choices more often than not made on political rather than economic grounds. The One Tambon Project is vulnerable to the same difficulties, including corruption/cronyism. In addition to an objective project selection process, the key here will be the extent to which market prices are allowed to define comparative advantage at the village level. If this occurs then the system should be able to develop a number of new and unique exports.

6. Dualism. The dual path program must be focused on integrating the economy; otherwise it may only compound the existing problems of dualism (the coexistence of a modern/foreign

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multinational and a more traditional economy). Here again a common set of market prices must be present in both tracks.

7. The underground economy. The government's recent attempts[33] to integrate much of the booming underground economy into the formal market economy suggests it is willing to tackle dualism, while at the same time expanding the government's revenue base.

8. Financial soundness. Thaksinomics is being applied on a rather fragile foundation. As the IMF notes: "prospects for sustained high growth depend on action to address remaining structural weaknesses, especially in the corporate and banking sectors. While enterprises made some advances in de-leveraging, their balance sheets remain fragile. Lending activity has gained some steam, but mostly at state-owned institutions and resolution of nonperforming loans at private banks continues to be slow." [34]

9. Fiscal capacity. While tempting, the government must not get carried away with many of the grand infrastructure projects under consideration. These appear to be of somewhat questionable value and would severely strain an already fragile financial system. There is also the danger that because more and more fiscal items are "off-budget" the real deficit is already considerably larger than reported.

10. Bubble economy. The recent stock-market boom must not be allowed to turn into another bubble. The government must constrain speculative flows while maintaining its overall objective of managed asset reflation. It is encouraging to note that unlike the run-up to the 1997 bubble, the Thai authorities appear willing to closely monitor[35] and to respond quickly to quell speculation in the consumer economy and segments of the stock and property markets.[36]

Conclusion

Thaksinomics is off to a very promising start in reorienting the Thai economy to the new challenges brought on by the rise of China and diminishing returns associated with the pre-1997 EAEM model of growth. The system is still evolving to meet new economic challenges, a sign of its pragmatic problem-solving orientation.

On broader issues like the war on terrorism, Thaksinomics appears well suited to increasing participation of broad segments of the

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population. Unlike most economic systems in the Middle East, Thaksinomics attempts to empower people. If large scale alienation, economic exclusions and disenchantment are associated with terrorism, then Thaksinomics, with its grassroots orientation, may well pay great dividends in this area. The West in general has a high stake in the success of Thaksinomics. Certainly many countries that are currently experiencing increasing terrorist activity – such as the Philippines, Malaysia and Indonesia – will be carefully watching the Thai experiment.

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Figure 1
Relative Openness in East Asia

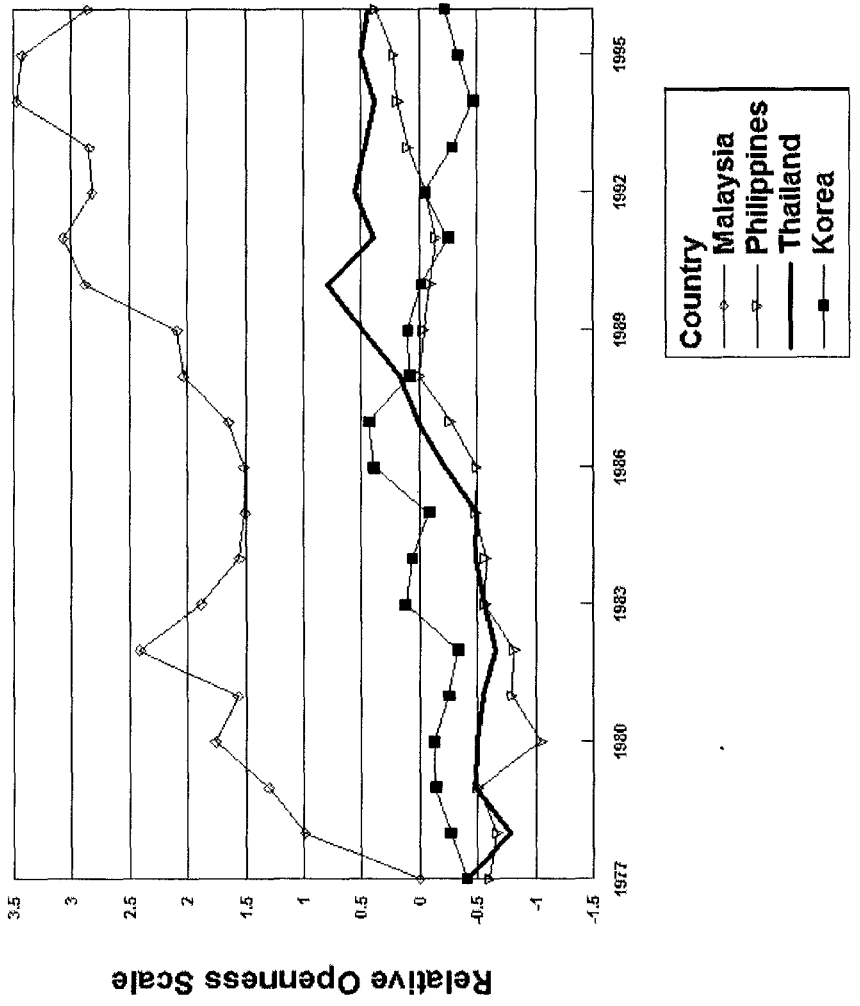

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Table 1

Total Factor Productivity Growth in Selected Countries

Study	*Collins and Bosworth*[2]	*Sarel*[3]	*Lee*[4]
Sample Period	1984-94	1991-96	1995-99
Thailand	3.3	2.3	-0.8
Singapore	3.1	2.5	-0.3
Malaysia	1.4	2	-1.1
Philippines	-0.9	0.7	1.1
Korea	2.1		3.0
	1984-94	1991-96	1995-99
Thailand -- IMF Estimates	3.1	2.1	1.9

Source: Thailand: Selected Issues (Washington: International Monetary Fund, August 2001), p.55

[2] S. Collins and B. Bosworth, "Economic Growth in East Asia: Accumulation versus Assimilation," Brookings Papers on Econmic Activity 2 (1996), pp. 135-191.

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Table 2

Porter's Microeconomic Competitiveness Index

(relative ranking)

Country	*1998*	*1999*	*2000*	*2001*	*2002*	*Average*
Singapore	10	12	9	9	9	9.8
Japan	18	14	14	10	11	13.4
Hong Kong	12	21	16	18	19	17.2
Taiwan	20	19	21	21	16	19.4
Korea	28	28	27	26	23	26.4
Malaysia	27	27	30	37	26	29.4
Thailand	**37**	**39**	**40**	**38**	**35**	**37.8**
China	42	49	44	43	38	43.2
Philippines	45	44	46	53	61	49.8
Indonesia	51	53	47	55	64	54.0

Source: Michael E. Porter, "Building the Microeconomic Foundations of Prosperity: Findings From the Microeconomic Competitiveness Index, Chapter 1.2, Global Competitiveness Report 2002-2003, p.31 (New York: World Economic Forum, 2002), p. 31
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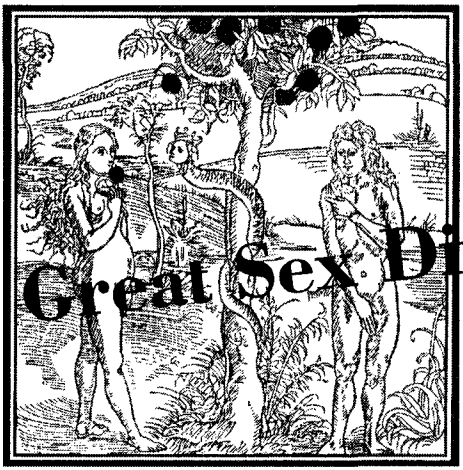
The Great Sex Divide



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The Limited Effectiveness of the Agreement on Subsidies and Countervailing Measures (SCM) in WTO

Emmanuel Nyahoho[1]
University of Quebec

This paper, based on an analysis of the settlement of disputes by the DSB from 1993 to 2002, explains that the SCM Agreement, grounded on criteria of "specificity" and "serious prejudice" can only be interpretative. Also, the difficulty in settling commercial disputes related to this Agreement will drag on for the simple reason that the borders of an acceptable subsidy cannot be defined. Finally, the importance placed on "prejudice" to the domestic industry is overstated by not taking into account the interest of consumers. In short, it matters more to call for a repeal of national legislation on countervailing measures than to have an international agreement on subsidies.

Key Words: WTO; GATT; SCM; DSB; OECD; Export subsidies; Tokyo Round; Uruquay Round.

Introduction

These days, there can be no denying that subsidies, especially to exports, have become an important cause of trade litigation between countries. Neither the GATT or the WTO rules, nor arrangements under the OECD, appear able to contain the deviations of their member nations. Following the principle that water seeks its own level, the generalized reduction in tariff barriers has resulted in a resumption of non-tariff protection measures, which come in a multitude of forms and demonstrate varying degrees of effectiveness. At the same time, the WTO, having assumed the mantle of arbiter but with no enforcement powers, can only rely on the will of the belligerents to reach agreement.

Thus, the capacity of the WTO's rules to facilitate international trade is very limited. We will examine this in the present paper. We begin by presenting a brief overview of the provisions of the Subsidies and Countervailing Measures (SCM) Agreement. We will next examine rulings on trade disputes issued within the framework of the WTO and

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related to this Agreement. In order to highlight the issues, we will focus on two specific cases of litigation: U.S. tax treatment of firms selling abroad, and the softwood lumber dispute between Canada and the United States. Finally, we proceed to a critical analysis of the Agreement's effectiveness and conclude with policy recommendations.

1. The Agreement on Subsidies and Countervailing Measures

1.1 Genesis

The agreement on subsidies and countervailing measures displays a history that needs to be underlined. During the 1950s and 1960s, subsidies were less used by various governments and confined to few industries, such as: energy, rail road, coal, aircraft, shipbuilding, (Mersserlin, 1987).

Since the beginning of the 1970s, the world economic outlook has drastically changed due to the oil price shock, the enormous volume and complexity of financial transactions, the demise of Bretton Woods and the advent of the floating exchange rate regime. Governments then came under strong pressure to assist their domestic producers, but were unable to raise tariffs because of the GATT rules, so they relied on Nonborder measures including export subsidies. This shift in commercial policies towards what may be called the "new protectionism," led to an agreement on subsidies and countervailing measures in the Tokyo Round (1973–1979), for a better understanding and interpretation of articles VI, XVI and XXIIII, which has been in force since the first of January 1980. The Tokyo Agreement on subsidies gave rise to a certain number of controversies. First, this Agreement does not provide a definition of subsidy but rather an illustrative list. Second, while it formally prohibits export subsidies, it recognizes other subsidies. As matter of fact, Article 11 states:

> "1. Signatories recognize that subsidies other than export subsidies are widely used as important instruments for the promotion of social and economic policy objectives and do not intend to restrict the right of signatories to use such subsidies to achieve these and other important policy objectives which they consider desirable. Signatories note that among such objectives are: a) the elimination of industrial, economic and social disadvantages of specific regions; b) to facilitate the restruc-

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turing, under socially acceptable conditions, of certain sectors, especially where this has become necessary by reason of changes in trade and economic policies, including international agreements resulting in lower barriers to trade; c) generally to sustain employment and to encourage re-training and change in employment; d) to encourage research and development programmes, especially in the field of high-technology industries; e) the implementation of economic programmes and policies to promote the economic and social development of developing countries; f) redeployment of industry in order to avoid congestion and environmental problems."

In other words, the Code accepts any kind of subsidy except export subsidies. But the key point is, what are the differences between export subsidies and general subsidies? Let's notice that Article 11 specifies that the provided list of subsidies, other than export subsidies, is only illustrative and non-exhaustive. One should not be surprised to see countries showing more imagination in interventionist commercial policies. The establishment of such Code where restrictions coast along "laisser-faire," undoubtedly reflects the divergent positions of GATT members. According to Messerlin (1987), developing countries have for a long time been opposed to an establishment of rules on subsidies in the GATT agreement. Likewise, the open declarations of industrialised countries, namely United States and European communities, for free trade, do not necessarily correspond to their effective commercial policies, which consist of industrial targeting and strategic promotion. For example, in agricultural trade policies, the United States has developed a reputation for toughness by crowing their support for free trade while knowing perfectly well that they cannot commit themselves (Chalmin, 1990). Finally, what seems evident is that it is not so important to remain clear on what the objective of any trade policy should be; instead, the main issues comprise their practical enforcement. For this reason, the subsidies Code of the Tokyo Round based on principles, seems hazy.

1.2 The Agreement of the Uruguay Round

The new agreement on subsidies and countervailing measures (SCM) is based on the Uruguay Round and encompasses 10 distinct

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parts with 7 annexes. Thus, unlike its predecessor, the Uruguay Round approach is to first provide a definition of subsidies and then establish three categories of subsidies (prohibited, actionable, non-actionable).

The definition (article 1) is general, in contrast to the illustrative list of the Tokyo Round. Also, not only a subsidy must exist, it must confer a comparative advantage. Consequently, the agreement introduces the concepts of "specific subsidy" and "serious injuries." There is specificity (Article 2) if a subsidy is available only to an enterprise or group of enterprises or industry or group of industries. Only specific subsidies are subject to the rules set out in the agreement. For example, a trade policy of export promotion by fiscal concessions in favour of the textile industry would be subject to the disciplines of the Accord. On the other hand, the same fiscal policy applied to any enterprise or any industry within the country is not prohibited because it is not deemed specific.

The agreement prohibits the following (Article 3): *« Except as provide in the Agreement on Agriculture, the following subsidies, within the meaning of Article 1, shall be prohibited: a) subsidies contingent, in law or in fact, whether solely or as one of several other conditions, upon export performance, including those illustrated in Annex; b) subsidies contingent, whether solely or as one of several other conditions, upon the use of domestic imported goods ».* The Accord also attempted to prohibit subsidies that cause adverse effects to the interest of GATT members such as an injury to a national branch production (Article 5). Those types of subsidies are called "actionable subsidies." Hence, one needs to define the meaning of "injury," which is done by Article 6 below.

> « 6.1 Serious prejudice in the sense of paragraph (c) of Article 5 shall be deemed to exist in the case of: a) the total ad valorem subsidization of a product exceeding 5%; b) subsidies to cover operating losses sustained by an industry; c) subsidies to cover operating losses sustained by an enterprise, other than one-time measures which are non-recurrent and cannot be repeated for that enterprise and which are given merely to provide time for the development of long-term solutions and to avoid acute social problems; d) direct forgiveness of debt, i.e. forgiveness of government-held debt, and grants to cover debt repayment..... » 6.3 Serious prejudice in the sense of paragraph (c) of Article 5 may arise in any case where one or several of the following apply: a) the effect of the

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subsidy is to displace or impede the import of a like product of another Member into the market of the subsidizing Member; b) the effect of the subsidy is to displace or impede the exports of a like product of another Member from a third country market; c) the effect of the subsidy is a significant price undercutting by the subsidized product as compared with the price of a like product of another Member in the same or significant price suppression, price depression or lost sales in the same market; d) the effect of the subsidy is an increase in the world market share of the subsidizing Member in a particular subsidized primary product or commodity as compared to the average share it had during the previous period of three years and this increase follows a consistent trend over a period when subsidies have been granted ».

Here again one can detect ambiguities. In fact, a subsidy of more than 5 per cent of prices may not necessarily cause injury to a member country. Furthermore, paragraph c) of Article 6.1 introduces safeguard measures, while paragraph 6.2 (not reported here) seems more restrictive. Finally, the Accord prohibits subsidies that bring a comparative advantage. This restrictive disposition is watered down by Articles 8 and 9 on non-actionable subsidies. The non-actionable subsidies are either non-specific subsidies or specific subsidies to support research and development (personnel expenses, instrument costs, consultants' services, general fees) or assistance to disadvantaged regions in a framework of regional development policy or assistance to industries for them to comply to environmental regulations. In the case of assistance to disadvantaged regions, beside the non-specificity criteria, the Accord sets out objective rules, such as the GDP per capita of the region which should be less than 85 per cent of the national average or an unemployment rate of at least 110% the national coverage.

What are the rules on the initiation of countervailing cases? Articles 4 and 5 clarify the procedures for disputes settlement. First it recommends to the contracting parties to consult each other for an acceptable agreement. If, after sixty days, those consultations fail, any member who believes to be adversely affected can present information and an argument to the Dispute Settlement Body (DSB). The DSB will then proceed to set up a special task group (panel) that can be assisted by a

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permanent group of experts (PGE) to examine the case.[2]

Turning to countervailing measures, per se, Articles 10 to 23 of Part V establish rules on the calculation of the amount of a subsidy, the basis for the determination of injury, and the amount of countervailing duties. A countervailing duty is defined as *« a special duty levied for the purpose of offsetting any subsidy bestowed directly or indirectly upon the manufacture, production or export of any merchandise »*. Thus, there is an implicit link between this Part V on countervailing measures and the first four Parts of the Code that specifically treat subsidies. The Accord states that the dispositions of Part II and Part III may be invoked in parallel with the provisions of Part V. Let's examine the content of this Part V.

Two main characteristics of countervailing measures have to be singled out: elements of proof, and the amount of the countervailing duty. On the first point, a member country can impose a countervailing duty only after justification and investigation. By Article 11, the request for any such duty must not only provide evidence on the existence as well as the possible amount of the subsidy, but also supply information on the degree of injury to a national branch of production. In assessing the level of the alleged injury, all relevant economic factors are to be taken into account, specially: effects on prices of similar products in the domestic market, the relative rise of subsidized imports, the effective or potential fall of production, sales, market share, profits, etc...

To recapitulate, the practical question of whether or not an export subsidy should be prohibited hinges on industry-specific factors. These include the targeting strategy and the shift of comparative advantages from foreign to domestic enterprises. A member country can impose countervailing duties only after successfully making the DSB launch an investigation, which is supposed to be completed within one year.

But the recommendations of the DSB may take longer to fully implement. Exemptions from disciplines of the Accord are *two-fold*. First, subsidies for research and development activities and assistance to

[2] The PGE, composed of five members, is presently as follows: M. Okan Aktan, (Chairman of Department of Economics, University Hacettepe², Ankara), M. Marco Bronckers (Lawyer, specialised in commercial law and professor of Law at University of Leyden); M. Jorge Casto Benieri (lawyer specialist in commercial law) and M Renato Galgao Flores junior, Professor of Law at federal University of Rio de Janeiro.

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disadvantaged regions, or for industrial conversions, are not prohibited. These safeguard measures are particularly important for industrialised countries. The second type of exemption is of primary concern to developing and least developed countries, which can use subsidies as commercial policy over a period not exceeding 8 years after the entry into force of the Accord. To consider the Accord more carefully, we may wonder about its real impact once all exemptions are taken into account.

Before tackling this issue, let's try to find the differences between the Tokyo and Uruguay Round subsidies Code. The above observations should easily convince the reader that the Uruguay Code did not truly innovate. To the old expressions of export subsidies and other type of subsidies, we have now actionable subsidies and non-actionable subsidies. The Tokyo Round recognizes that subsidies play an important role in industrial restructuring and for employment promotion. The Uruguay Round brings forward these principles by exempting from discipline; subsidies to R&D, and assistance to disadvantaged regions; while developing countries gain favorable treatment. Of course, the Uruguay Round seems distinct, in comparison to Tokyo Round, by the creation of an institutional body for dispute settlement (DSB) and the adoption of a precise calendar for investigation. Nevertheless, the presence of so many notwithstanding clauses and the necessity of demonstrating injury add to the unavoidable long delay in decision making by the DSB are factors that would make any arbitration's task quite difficult in the real world. The question can now be raised as to how the disciplines set out in the Uruguay Round Code can be enforced.

2. Dispute Settlement

The effectiveness of the SCM Agreement can only be accurately evaluated in light of its results in settling trade litigation, which are regularly commented in the WTO's annual reports. Thus, we consulted every one of these reports between 1993 and 2002, a sufficiently long period for us to appreciate the issues. We limited our examination to instances of trade litigation directly involving the SCM Agreement, omitting those dealing with antidumping provisions and the Agreement on Agriculture. Over the entire period considered (1993–2002), we found 15 cases of trade litigation that were subject to a ruling by the

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panel (Table 1). Here are some key factors that these cases reveal.

2.1 The Concentration of Disputes Within the Most Industrialized Nations

The instigation of a hearing into the existence of a subsidy, and whether said subsidy causes prejudice to an industry, is tangible evidence that a signatory to the SCM Agreement has lodged a complaint.

Such a proceeding, conducted by a member country, may lead to the imposition of provisional or permanent countervailing duties. Examining the statistics compiled by the WTO on who launches these cases reveals that a limited number of countries are implicated, and that furthermore it is always the same ones, notably the United States, the European Community, Brazil, Canada, and Australia (Table 2).

Countervailing duties (provisional or permanent) have also been imposed by these same countries. It is noteworthy that the United States and the European Community represent a little more than 60 per cent of all such measures in effect.

Table 1 provides information on the industries implicated in these disputes, to wit: aeronautics, automotive, steel, leather, softwood lumber, and pure and alloyed magnesium – all sectors that are highly competitive and in which a subsidy can have a material impact, i.e. provide domestic firms with a direct advantage in their efforts to penetrate foreign markets. Thus, it is no coincidence that the observed disputes involve the most industrialized countries, whose competitive advantage seems to be dissipating and who, on the one hand, dispose of the means to subsidize domestic firms and, on the other hand, have the resources required to launch and defend cases before the Dispute Settlement Body (DSB). We can reasonably assert that the SCM Agreement is the favored battleground for these "giants of trade." Actions launched by the United States are usually against the European Community, Canada, Brazil, and Australia. The European Community, like Canada, typically targets the United States.

2.2 The Deadlock in Implementing the Recommendations

Do the reports generated by the appellate body and the panels allow the differences between countries to be settled? First, it is worth noting that under the transparency rules, a greater number of countries (89 in December 2001) notified the WTO of their laws or regulations

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pertaining to compensating duties. This measure is designed to pre-empt trade litigation.

We also see that the DSB carefully adheres to the timetable for studying dossiers, by creating the panels as quickly as possible and ensuring that the generated reports are adopted (Table 1). The problem inherent in this process is to be found in implementation of the reports generated by the appellate body and the panels. Of the 15 cases accepted between 1993 and 2002, we discover that only 5 ended in an apparent settlement between the affected parties, while the other 10 remain in limbo. Countries often appeal on procedural grounds or because of disagreements with the reports' conclusions. Of even greater concern is the fact that implementation of the appellate body's recommendations does not always receive unanimous support from the parties.

Indeed, while the country that is being challenged may declare to the DSB that it is implementing the recommendations, the country having filed the grievance will assert that nothing has changed. This is well illustrated by the case of the United States versus Australia in the automotive leather dossier, the European Community versus the United States on fiscal treatment, and Canada versus Brazil in aeronautics. Let us use a closer look at the last two to gain a better understanding of the difficulties confronting the DSB.

2.2.1 Fiscal Treatment of Exporting Firms: Complaint Lodged by the European Community

This case concerns U.S. tax law (FSC Act, articles 921 to 927) as it applies to firms selling abroad – exempting part of their export revenues from direct taxation. The European Community claims that this aspect of the U.S. tax system is a violation of the SCM and agricultural Agreements. On July 1, 1998, the European Community requested the formation of a panel. This request was turned down at the meeting of the DSB because of opposition from the United States. It is not surprising that the United States would object to the creation of the panel, but the initial decision of the DSB to ignore the allegations of the European Community is quite shocking since, by the DSB's own admission, its position was founded on the U.S. objection.

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On September 22, 1998, the DSB established a panel to study this dispute. Barbados, Canada, and Japan reserve rights as third parties. The panel's report, submitted on October 8, 1999, concluded that the FSC regime is indeed subject to export regulations and is thus prohibited by article 3.1 a of the SCM Agreement. In fact, according to the panel, the FSC Program "is only available with respect to 'foreign trading income'; foreign trading income arises from the sale or lease of 'export property' or the provision of services relating to the sale or lease of export property; and export property is limited in effect to goods manufactured, produced, grown or extracted in the United States which are held for direct use, consumption or disposition outside the United States." (WTO, 2000, p. 73).

Also, the panel believed that the FSC regime is incompatible with the Agreement on Agriculture. In keeping with the provisions of the SCM Agreement, the European Community asked the United States to withdraw the affected measures no later than October 1, 1999. However, the panel extended this deadline until October 1, 2000 in order to allow the United States time to enact the required legislative changes. Confronted with this recommendation, the United States appealed on November 26, 1999, on the basis of certain legal points. The appellate body confirmed the panel's conclusion that the FSC regime is incompatible with article 3.1 a of the SCM Agreement and refuted the panel's assertion regarding the Agreement on agriculture.

On November 17, 2000, the United States announced to the DSB that it had adopted a law (the ETI Act) on November 15 abrogating the provisions of the FSC, and thus implemented the DSB's recommendations. However, "on the same date, the European Community stated that, in its view, the United States has failed to comply with the DSB recommendations and rulings." (WTO, 2001, p. 89). On November 27, 2000, the United States requested arbitration. The European Community, for its part, requested that a panel be set up. Following an agreement between the United States and the European Community, the arbitration process was suspended pending establishment of the panel.

The panel examined the dossier, and observed that "According to the Panel, the ETI accorded less favorable treatment to imported

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products than to like products of United States origin and was, therefore, inconsistent with Article III: 4 of the GATT 1994. "The panel also concluded that the United States has not fully withdrawn the FSC subsidies found, in the original proceeding, to be prohibited export subsidies under Article 3.1 (a) of the SCM Agreement and, therefore, has failed to implement the recommendations and rulings of the DSB made pursuant to Article 4.7 of the Agreement (WTO, 2002, p. 96).

The United States, unwilling to withdraw the FSC subsidy, launched an appeal on October 15, 2001. The appellate body released its report on January 14, 2002, confirming the conclusions of the panel, i.e. that the United States acted in a manner incompatible with its obligations under the SCM Agreement. The European Community then decided to take countermeasures in the form of an *ad valorem* duty of 100 per cent on imports of certain goods from the United States. A ceiling of $4043 million was placed on this tax. This decision of the European Community was endorsed by the WTO (WTO, 2003, p. 95–96). In conclusion, this dispute has not yet found a solution that satisfies all parties.

2.2.2 Aircraft Export Financing Program: Dispute Between Canada and Brazil

This dispute involves measures, implemented in both countries, to promote the export of aircraft. On the one hand, Canada complained that the export financing program (PROEX, or Programa de financiamento as exportaçoes), available to foreign purchasers of aircraft built by the Brazilian firm Embraer violated article 3 of the SCM Agreement. Recall that this program is used by the Brazilian government to provide export credits to Embraer, through either direct financing or interest-equalization payments.

On the other hand, Brazil claims that Canada or the provinces support the export of civilian aircraft manufactured by Bombardier or its affiliates, in particular by granting financial assistance in the form of credits over the intermediary of the Canada Account as well as direct assistance from the Technology Partnerships Canada Fund for developing new products[3].

[3] This account is administered by the Export Development Corporation (EDC). Brazil also maintains that this Canadian Crown Corporation dispenses preferential credit to boost exports

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Canada formally launched its case on June 18, 1996 and Brazil on March 10, 1997. On July 23, 1998 (nearly two years after Canada's request), the DSB established a panel to study whether the two countries' export assistance programs violated article 3 of the SCM Agreement. The United States and the European Community reserved rights as third parties. On April 14, 1999, the panel submitted its report. Here are the principal results: "The interest-rate equalization payments provided by Brazil on export sales of regional aircraft under the Programa de Financiamento as Exportaçoes (PROEX) are export subsidies inconsistent with Article 3 of the SCM Agreement (WTO, 2000, p. 71)." The panel recommended that Brazil abrogate the subsidies immediately, i.e. within 90 days, or at the latest by November 18, 1999. As to Brazil's claims, the panel ruled that the financing assistance under the Canada Account and the Technology Partnerships Canada Fund were also incompatible with article 3 of the SCM Agreement. However, the panel rejected Brazil's allegations concerning the Export Development Corporation's financing activities owing to insufficient proof of benefits conferred by these subsidies.

As expected, both countries appealed the panel's report on May 3, 1999. However, the appellate body confirmed the panel's results pertaining to the PROEX program and asked Brazil to withdraw these subsidies within 90 days. "Also, the appellate Body has found that certain assistance provided by Canada and certain of its provinces to the Canadian regional aircraft industry constituted export subsidies prohibited under Articles 3.1 (a) and 3.2 of the SCM Agreement." (WTO, 2000, p. 72).

What impact has this ruling of the DSB had? In its annual report for 2000, the WTO (2000, p. 83) announced that Brazil had declared being in compliance and having eliminated the offending measures within the agreed timeframe. However, Canada continued to maintain that Brazil was not in line with the ruling. On December 9, 1999, on Canada's request, the DSB again called on the panel to re-examine this dispute.

The panel's report on compliance was issued on May 9, 2000, confirming that Brazil was not following the recommendations. Weary of

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of Canadian aircraft.

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the battle, Canada asked the DSB to authorize the application of countervailing measures against Brazil, which in turn seized the opportunity to demand arbitration with the goal of determining whether such measures were justified. A little later, on December 12, 2000, Brazil informed the DSB that it has brought its PROEX program in line with its obligations under the SCM Agreement. Canada did not agree, and on January 27, 2000, requested that a panel be set up, which ruled on July 26, 2001. Here is the panel's conclusion: "Brazil's revised export financing programs for regional aircraft, PROEX III, is not as such, inconsistent with the SCM Agreement." (WTO, 2002, p. 93).

The reader will note the weakness of this statement, as reflected by the use of "not as such." In short, this stalemate drags on. In April 2002, Canada, though worried about its image as a "good global citizen," decided to play the same game as Brazil by granting a generous subsidy to Air Wisconsin for the purchase of aircraft from Bombardier.

On December 3, 2002, Bombardier announced that it had signed a $140 million contract for delivery of 50 aircraft to Air Wisconsin. A panel, constituted in March of 2001 on Brazil's request, had already ruled: "The Panel upheld Brazil's claim that the EDC Canada Account financing to Air Wisconsin, to Air Nostrum and to Comain in July 1996, and February 1999 constituted a prohibited export subsidy contrary to Article 3.1 (a) of the SCM Agreement." (WTO, 2002, p. 103). In its most recent, 2003 annual report, the WTO summarized the disagreements between Brazil and Canada in this dossier. We also note that during this dispute between Brazil and Canada, the beneficiary (the United States) did not take a position, but nonetheless refrained from sending a thank you letter to the belligerents.

In light of these observations, can we deem the dispute settlement mechanism of the WTO to be effective? This is a difficult question to answer, for reasons that will be explained hereafter.

3. The Rationality and the Prospects of the SCM Agreement

Given the difficulties implementing the recommendations of the DSB, we can henceforth seriously question the usefulness of the SCM Agreement. On this matter, let us refer to the explanations given by Jackson (1992, p. 249–273), who provides an international framework

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for the rules on subsidies and countervailing duties.

First, he reminds us that countries have long resorted to domestic laws to combat trade practices deemed unfair (dumping, subsidized imports, etc.). This is particularly true of the United States, where rules on "unfair trade" can be traced back to the end of the 19th century (the Sherman Act, 1890), section 73 of the Wilson Tariff Act, 1894, and the antidumping act, 1916. Finger (1992) points out that by around 1921 the United States, France, Canada, Australia, New Zealand, the United Kingdom, and most other countries in the British Commonwealth had enacted antidumping laws. Thus, as we previously indicated, measures undertaken against trade practices considered unfair are so pervasive as to effectively undermine the principle of free trade defended by the GATT. Resorting to subsidies raises even more difficult issues. On the one hand, we recognize that "subsidizing" is one of governments' principal activities – serving as a tool for economic and regional development and income redistribution. Jackson (1999, p. 263) maintains that it is misguided to think that a government can resist subsidizing. Conversely, it is recognized that a subsidized import is the new face of protectionism. How, then, can we be sure that the role of a sovereign government will not intrude on the principle of trade freedom? In this context, Jackson's argument in favor of an international framework for constraining subsidies is worth examining. According to this author, while countries have already adopted legal provisions for dealing with countervailing measures, unilateral application of said measures is damaging to free trade. Consequently, a multilateral consensus is required to define the rules of the game while simultaneously leaving a margin of manoeuvre for governments to exercise their sovereignty.[4] To accomplish this, Jackson (1992, p. 262–273) introduces the concepts of actionable subsidies and specificity, both of which the Uruguay round retained. It is of interest to note that Jackson himself had doubts about the effectiveness of his proposals, as is evident from the title of his essay "Perplexities of Subsidies in Interna-

[4] This point of view is also shared by authors such as Ray (1995), Low (1982), and Snape (1991), who favor a more transparent framework for the GATT's provisions concerning subsidies. Messerlin (1987) asserts that such an international agreement would protect governments from the influence of interest groups.

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tional Trade," where he writes: "The whole conceptual structure of these policies (subsidies) is very intricate and very confused, and as I noted... we are not going to be able to solve these problems in this book; nor is it likely that they will be solved in the near future."

In reality, the issue of "subsidization" is strangely reminiscent of that of "dumping." The existence of national antidumping policies is not, in and of itself, a reason to frame them in international protocols. Lafay and Siroën (1994, p. 70) maintain that "the legitimacy of antidumping and countervailing duties is not self-evident." Indeed, economic analysis clearly reveals that antidumping rhetoric is simply a cover for protectionism, and that these measures have become a veritable burden, Irwin (2002, p. 113), Boltuck and Litan (1991). This is why Finger (1992), after examining the implementation of antidumping measures, concludes that their administrative process remains characterized by: (i) complexity at the cost of precision, (ii) complexity and camouflage conducive to the abuse of power, and (iii) judgments, rather than observations, in the comparison of the domestic and export prices.[5] Knoll (1989) draws attention to issues of causality linking the prejudice to an industry and subsidized imports when he says, "Questions of interpretation involving causation still remain." There are several, such as how much injury is required, who has the burden of proof, and how the Commission (The U.S. International Trade Commission) should measure injury. It is easily demonstrated that this observation of Finger's applies to the case of a subsidy. However, let us first take stock of the positive role played by the DSB.

So far, various authors have identified the large number of disputes as an indicator of how well the new system functions, Rainelli (2002, p. 100–111), Jouanneau (2003, p. 33), and English and De Wulf (2002, p. 160–170). The number of complaints lodged with the WTO now exceeds 200 for all trade-related measures having been challenged (safeguard actions, antidumping duties, intellectual property, public markets, etc.). Rainelli identified three key points concerning the distribution of the complaints. The first he calls the "activism" of the United States, which

[5] In computing the dumping margin, the concepts used, such as "prejudice," normal value, production cost, reference periods, etc. leave room for a subjective appreciation.

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is the country most frequently challenged. The second is the small role played by Japan, and the third relates to developing countries, which are resorting to the WTO with increasing frequency. This opinion is shared by Jouanneau (2003, p. 37), who states: "While the GATT was stymied by unilateralism, the WTO has brought about stability and predictability. Each country knows that it can have access to the DSB if it feels aggrieved, regardless of how powerful the other party is."

In light of this positive balance sheet, proposals have already been advanced to improve and clarify the dispute settlement process. The European Union suggests, among other things, to increase the arrangement's transparency and to create a permanent panel of twenty-some full-time experts (instead of the current number of five) so as to ensure a more equitable representation of developing countries (Jouanneau, 2003, p. 37–38). Integrating representatives of civil society into the process is even being considered. While in no way wishing to impugn the positive work of the DSB, we feel that the effectiveness of the implementation of the SCM Agreement must be determined on the basis of its actual results in dispute settlement. As we have already pointed out, on the basis of WTO annual reports, since its creation the implementation record of the SCM Agreement illustrates its complexity very well, beginning with the very definition of a subsidy.

Indeed, the WTO's approach, based on criteria of specificity and serious prejudice, is very conducive to a variety of interpretations. Take, for example, the terms of article 1, which specifies that a subsidy will be deemed to exist if "...the public sector provides goods and services that extend beyond general infrastructure, and purchase goods."

The reader will observe how difficult it is to distinguish between goods and services supplied as infrastructure ("general," as it were) and for other uses. A broad interpretation of this definition can lead one to consider a wide variety of governmental activities as types of subsidies.

Thus, Jackson (1992, p. 261) concludes that services such as fire prevention, police, transportation, education, health, etc., which are all supported by the government, can be deemed subsidies that help domestic firms compete more effectively abroad.

Clearly, while these activities neatly fit the mould of "infrastructure," there can also be specific "infrastructure," as in the case of a

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specialized training centre, a rail line serving a particular region, etc. The notion that a subsidy to exports must be distinguished from all other types of subsidies does not really help us understand the issues, for the simple reason that any "subsidy" can have a direct impact on the international competitiveness of the affected firms. The Embraer-Bombardier dispute, which we describe above, provides a good illustration of this fact – where a research support program adopted by Canada through the Technological Partnership program runs up against Brazil's direct export subsidization approach.

The U.S. tax treatment of exporters (the FSC Act), which was denounced by the European Community, is not so easily disposed of. First, all countries have tax systems that treat different industries, personal incomes, and even regions varyingly. Next, let us bear in mind that the complexity of the fiscal regime does not actually indicate the true tax load borne by companies.

Had it not been for large production and R&D subsidies, the European Airbus consortium would never have been able to begin operations and arrive at the point of competing with Boeing, McDonnell Douglas, and General Dynamics, who in turn benefit from substantial R&D funds extended by the Pentagon for defense.

The softwood lumber trade dispute between Canada and the United States is also very revealing. The United States contends that the low stumpage fees levied on lumber harvested from Canada's public forests amount to a subsidy. A counterargument can be made that a generous unemployment insurance program that is targeted at certain categories of workers, or certain social and environmental standards, can also be construed as a subsidy.[6]

Recall that Finger's (1987) study of 460 cases of countervailing duties indicated that a very high proportion of these cases (94 per cent) are imposed in countries in which they are completely unwarranted. On the whole, it is an awkward business seeking to define a "subsidy" and prove its existence, for the fundamental reason that the scope of

[6] We point out in this context that, in the United States, organizations dealing with the performing arts plan their activities so as to ensure that their artists and workers are eligible for unemployment insurance. The states New York and California, renowned for their cultural life, make special provision for access to unemployment insurance (Netzer, 1978, p. 45).

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acceptable practices cannot be delineated. For example, we have observed that, in the cultural industries, subsidization assumes a near limitless variety of forms (preferential rates, government funded purchases of books for libraries, promotion of local products in festivals, construction and maintenance of buildings for cultural events, etc.). It is this feature of "diversity" and an unlimited horizon that makes it possible for a country to replace one type of subsidy with another that is just as efficient. Thus, it is not surprising when nations accuse each other before the DSB of ignoring the recommendations of the panels and the appellate body (cf. Table 1). Finally, a firm that feels it is able to compete with its rivals but not with the bottomless pockets of a government, is most likely unaware that its own dynamism directly or indirectly depends upon some "subsidized activity."

Let us take a closer look at the notion of prejudice caused by a subsidy. Standard international trade theory explains that a subsidizing country suffers a deadweight welfare loss owing to the reduction in consumer surplus, the cost of the subsidy, assumed by the government, and the ensuing depreciation of the terms of trade. And what of the country benefiting from subsidized goods?

According to this same school of thought, the receiving country benefits from a welfare boost, since the price of the subsidized goods falls and consumer surplus increases, largely compensating the loss of domestic production. In concrete terms, this means that the export of Canadian softwood, ostensibly "subsidized," provides a substantial benefit to U.S. consumers. Emphasis on the "prejudice" done to the U.S. softwood industry thus completly ignores the gains accruing to its consuming countrymen.

This economic analysis has been under fire since the beginning of the 1980s. Several economists, including Brander (1992), and Brander and Spencer (1981, 1983), invoke arguments based on the notion of profit-shifting subsidies, the prisoner's dilemma, or strategic trade policy to argue in favor of the benefits of subsidies to the countries that provide them. Emphasis is also placed on the predatory aspect of subsidies' impacts on foreign markets.

Furthermore, empirical studies evaluating the impacts of export subsidies remain controversial. Indeed, the incremental exports made

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possible by the activity of an official body issuing credit or insurance depend upon the structure of production costs of the affected firms and also on the nature of the demand for the good. More precisely, as Abraham (1990, p. 106–107) explains, subsidization of exports has a greater impact when there is little difference in production costs between domestic and foreign firms, and when demand for the good is highly elastic. Thus, to maximize the impact of export subsidies, these must be targeted at very competitive industries (Levy, 1989; Meltze and Messerlin, 1987; Itoh and Kiyomo, 1987; Eaton, 1987; Fleisig and Hill, 1984).

In practice, however, credit and insurance agencies subsidize firms with widely varying characteristics: those that are highly competitive as well as oligopolies, even monopolies. Consequently, the effectiveness of subsidizing exports can only be evaluated on a case by case basis (Ray, 1995, p. 13–14). Regardless of the validity of each of these various points of view, the key elements of international competitiveness and the marketing process need to be considered.

First, any subsidy, whether direct or indirect, is only one of many factors in competitive advantage. In its annual publication "The World Competitiveness Yearbook," the International Institute for Management Development (IMD) lays out 10 rules for a country to remain competitive.

These rules range from the creation of a stable and predictable legal environment to the establishment of a flexible economic structure, from investing in infrastructure to investing in education, especially at the secondary level, and also preserving the social fabric by reducing income inequality between citizens (IMD, 2001, p. 49). By extension, persistently resorting to subsidies may result in a misallocation of resources and undermine the country's competitiveness. Thus, English and De Wulf (2002, p. 170) encourage developing nations to exercise self-discipline in the granting of export subsidies, and to rather provide for education, both as on the job training and in institutions, as well as technical assistance to allow firms access to technologies, and even to establish duty-free zones. These authors put more emphasis on the distortionary effects of the tax burden and the inefficiency of subsidies than on compliance with the SCM Agreement.

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Moreover, if a country deliberately opts to sell a specific good at a discount on foreign markets, it will not be able to do so for other goods. In other words, a subsidy, by being specific, forces the country to specialize in the affected industry to the detriment of other sectors of activity. The country is thus trapped into using its resources to confer competitive advantage, and incurs a concomitant risk. Notice that the practice of domestic firms selling cheaply on the domestic market does not solicit as much criticism.

As Carney and Zellner (2000) remind us, "when a large aircraft manufacturer sets its price low enough to eliminate all competition, this would seem to be tantamount to abusing a dominant position." However, U.S. courts have not, in general, adhered to this interpretation. Rather, they have deemed "price wars" to be beneficial to consumers and costly to firms. According to these authors, of the 37 cases on which the U.S. Supreme Court has ruled since the Brooke Group decision[7], not a single plaintiff has won. In a word, fighting against predatory pricing appears to be difficult because their efficiency is hard to evaluate.[8]

Let us return to the issue of "specialization" and illustrate our point with two specific examples: the softwood lumber dispute between Canada and the United States, and the European Community versus the United States in the aeronautics case (Airbus subsidy). If the management of Canada's forestry reserves is such that softwood lumber remains inexpensive, American consumers can only be pleased by the fact that this situation will cause Canada to continue to be specialized in exporting this good. However, we cannot imagine Canada being able to subsidize the export of all goods and services. Similarly, when European governments subsidize Airbus, they are simply transferring limited resources from other sectors of economic activity to aeronautics and, in doing so, they are driving down the price of aircraft for purchasers of these goods worldwide. Let us emphasize here that NASA's activities, like those of the Canadian Space Agency and the European initiatives,

[7] This is the complaint lodged against Brown and Williamson Tobacco Corporation accusing them of having broken the law by selling generic cigarettes below their production cost.

[8] Predatory pricing consists of setting prices below those that maximize profits for purposes of partially or totally eliminating the competition.

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which are subsidized, are already yielding commercial products. Carliner (1992, p. 162) reminds us that, when the United States decided to put a man on the moon for reasons of national pride, France opted to build a supersonic jet to prove its technological know-how. Thus, there are deeply held reasons for governments to provide public assistance to specific industries.

Conclusion

This brief overview reveals that the word "subsidy" encompasses a very complex notion. No legislation can adequately frame the definition of this concept, and any such effort will inevitably be open to a variety of interpretations. Consequently, the WTO Agreement on subsidies and countervailing duties, which is based on the principles of "specificity" and "prejudice," constitutes a minefield of legislative entanglements in which only the most adroit and strongest will be able to succeed. Indeed, implementation of the SCM Agreement clearly demonstrates that it is the United States, the European Union, followed by Canada and Brazil, who make use of it, and do so to accuse each other. Even more significantly, these trade disputes are concentrated in industries in which the competitive position of the plaintiffs seems to be eroding (steel, automotive, aeronautics, pure and alloyed magnesium, softwood lumber, etc.).

Also, despite the sincere efforts by the DSB to settle these disputes within the established timeframe, we observe that many of the cases are deadlocked. We explain that this deadlock or difficulty in coming up with satisfactory rulings on SCM Agreement related cases will persist owing to the inability to delimit an acceptable notion of subsidy.

Furthermore, the fact that a prohibited subsidy is repealed does not really tell us anything about the level of protectionism in the affected industry, since a country can resort to another type of subsidy, more subtle but equally efficient. Finally, the importance assigned to the concept of "prejudice" to an industry seems somewhat exaggerated, since this reasoning does not account for the interests of consumers. Too often we forget that price discrimination, or selling at a discount, is a common practice of firms selling on the domestic market. These various observations are adequate to conclude that, instead of attempting to

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develop an international framework for combating subsidies, a more effective approach to achieving the same goal might be the negotiated abolition of laws imposing countervailing duties.

Table 1

Panel And Appellate Body Reports

Complaint By	**Dispute**	**Date of Panel establishment**	**Reports adopted**	**Implementation of adopted reports**	**Dispute's resolution**
1-Ec Against United-States	Countervailing duties imposed by United States on a number of products and based on the methodology of the « change in ownership »	Septem-ber,10 2001	Methodology found by the Panel as inconsistent with the requirements of the SCM Agreement.	United States notified on September 9th, 2002, its decision to appeal. The Appellate body reversed the panel's findings	No
2-Australia, Brazil, Chile, EC, Korea, India, Indonesia, Japon, Thaïland Againt United-States Also Complaint By Canada And Mexico	Amendment to the Tarif Act of 1930 signed into law on October 28, 2000 entitled « continued dumping and subsidy offset act of 2000 » (The Byrd Amendment).	August 23rd, 2001	The Panel found that the Act was inconsistent with articles 5.4, 18.1 and 18.4 of the anti-dumping Agreement, Articles 11.4, 32.1 and 32.5 of the SCM Agreement and with the GATT 1994.	The Panel recommended that the DSB request the United States to bring the Act into conformity with the Anti-dumping and the SCM Agreement and the GATT 1994 by repealing the ACT. On October 18th, 2002, the United States notified its decision to appeal.	No
3-Canada Against United-States	Claims by Canada that section 129 (c) (1) of the Uruguay Round Agreements Act had the effect of making the methodology used by the United States to determine anti-dumping duties, inconsistent with the SCM Agreement.	August, 23rd, 2001	Claims by Canada rejected by the panel	The DSB adopted the Panel report on August 30, 2002	No

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4-Canada Against United-States	Measures treating export restraints as subsidies	September 11, 2000	An export does not constitute a financial contribution in the sense of article 1.1 (a) (1) of the SCM agreement	No recommendation has been made with respect to the United States obligations	No
5- EC Against United-States	Countervailing duties on certain hot-rolled lead and bimuth carbon steel from the United Kingdom, in particular from United Engineering steels Ltd (UES) and British Steel PLC	February, 17th, 1999	The Panel concluded that the countervailing duties imposed by the United States were inconsistent with Article 10 of the SCM agreement. Recommendation made by panel that the United States bring the duties into conformity with the SCM, but declined to suggest ways in which the United States might implement this recommendation.	On January 27, 2000. The United States notified its decision to appeal. The appellate body maintained the Panel foundings and recommendations	No
6- Japan And EC Against Canada	The auto-pact between Canada and United-States that limits the number of manufacturers authorized to import vehicles on duty-free in Canada and that obliged a manufacturer to maintain production facilities in Canada during the period of reference (1963-1964)	February, 1st, 1999	On June 19, 2000, the DSB adopted the Panel and Appellate Body Report requesting Canada to end the measure at no later than February 19th, 2001	Canada informed the DSB that the recommendations were implemented since February 18th, 2001	Yes
7- EC Against United-States	Tax treatment « for foreign sales corporation » (FSC Articles 921 to 927) that provides tax exemption on revenue derived from export activities	September 22, 1998	The panel found FSC inconsistent with the article 3.1 a) of the SCM Agreement and with the Article 9.1 of the Agreement on Agriculture. Recommendations to that the FSC subsidies should be withdrawn.	On November 26th, 1999, the United States notified its decision to appeal. The United States enacted the FSC repeal on November 15, 2000. Complaints by EC that the United States are not respecting the recommendations.	No

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8-United-States Against Australia	Subsidies provided to producers and exporters of automobile leather (loan and payments from the Australian Government to an Australian Company).	January 22nd, 1998 and June 22nd, 1998	The loan provided is not a subsidy contingent upon export. The payments provided are subsidies and inconsistent with article 3.1 and 3.2 of the SCM Agreement.	On November 1999, Australia informed DSB that it has implemented to the recommendations. On October 4th, 1999.The United States informed the DSB that Australia were not following the recommendations. On January 21, 2000 the original panel was reconvened and concluded that the Australia had failed to its obligation. On July 24, 2000, notification of mutual satisfactory solution.	Yes
9-Brazil Against Canada	Brazil claimed that subsidies (financing are loan guarantees, interest rate support) provided to Canada's regional aircraft industry through the Export development corporation (EDC) (both Canada and Corporate Accounts) and by Investissement Québec	July 23rd, 1998	On April 14, 1999 the panel found that certain measures of EDC are inconsistent with the SCM Agreement	On May, 3rd, 1999 Canada notified its decision to appeal. The appellate body endorsed the conclusion of the Panel On November 19, 1999 Canada notified that it has withdrawn the measures	No
10-Canada Against Brazil	Canada claimed that subsidies are provided by Brazil to the regional aircraft industries through the agency PROEX	July 23rd, 1998	On April 14, 1999, the panel concluded that PROEX activities are inconsistent with the SCM Agreement	On May 2nd, 1999, Brazil notified its decision to appeal. The Appellate body maintained the conclusion of the panel On November 19th, 1999, Brazil informed the DSB that is has implemented the recommendations.	No

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11-EC, Japon and United-States Against Indonesia	Tax exemption on import of vehicles and parts		The panel accepted the allegations of EC that Indonesia has failed to it's obligation to article 5c) of the SCM Agreements but rejected the complaints of the United States on the ground that there is no serious prejudice to American exporters who do not export directly to Indonesia	On July 15th, 1999, Indonesia declared to the DSB that it has implemented the recommendations	Yes
12-EC Against United States	Countervailing duties in certain steel products considered as superior to the amount of subsidy	June 1993 and April 1994	The Panel concluded that certain measures taken by the United States were not inconsistent, while other were inconsistent with the SCM Agreement	Suspension of the works of the panel in August 1994 on demand of EC	No
13-EC Against Brazil	Countervailing duties proceedings concerning imports of milk powder form the EC	March 1993	The imposition by Brazil of provisional countervailing duties was inconsistent with the SCM Agreement. Request made to Brazil to end the measures	Brazil expressed dissatisfaction with some of the conclusions of the panel and reserved the right to take suitable measures to avoid any injury to its industry	No
14-Canada Against United States	Measures affecting the importation of certain softwood lumber from Canada	August 1986 and December 1991, February 1992	Countervailing duties imposed by the United States were found inconsistent with the SCM Agreement	Bilateral memorandum Accord concluded in 1987 and where Canada has to impose an 18% duty on its softwood lumber export. Denunciation of the Memorandum by Canada	No
15-Canada Against United States	Measures of countervailing duties treating the import of pur and allied magnesium as subsidised through the favourable electricity bill provided by Hydro Quebec to producers (Norsh-Ydro)	January 1992	Dispute settlement suspended on demand by Canada and consent by United States	Canada has withdrawn the complaint	Yes

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Table 1

Summary of Countervailing Duty Actions

Reporting part	Initiations								Measures in force							
	1994*	1995	1996	1997	1998	1999	2000	2001	1994	1995	1996	1997	1998	1999	2000	2001
South Africa	-	-	-	1	1	2	2	4		-	-	0	0	0	0	1
Argentina	-	1	1	1	0	0	0	0		-	1	1	3	3	3	3
Australia	4	0	1	1	0	0	1	1		13	13	7	6	5	5	5
Brazil	2	0	0	0	0	0	0	-		6	7	6	6	6	6	-
Canada	2	3	0	0	0	3	5	3		6	5	5	5	10	7	9
Chile	4	0	-	-	-	-	4	-		0	-	-	-	-	0	-
EC	-	0	1	4	8	20	8	2		2	2	3	3	6	13	19
United-States	12	2	2	6	12	10	1	15		71	67	52	60	61	46	43
Mexico	-	0	0	1	0	0	0	0		-	11	8	11	11	10	1
New Zealand	-	1	4	1	0	0	0	0		1	2	2	3	3	2	2
Venezuela	-	0	0	0	0	1	0	0		0	3	3	3	3	3	3
Peru	-	0	-	1	-	-	-	1		1	-	0	-	-	-	-
Israël	-	2	-	-	-	-	-			-	-	-	-	-	-	0
Total	24	9	9	16	21	36	21	26		133	103	87	100	108	95	86

* Period of July 1st, 1993 to June 30, 1994 only.

Source : Compilations from WTO, Annual report, various years.

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Book Reviews

Understanding the United States:
Illusions that Guide Contemporary America
Dwight D. Murphey
Council for Social and Economic Studies, 2003

This anthology incorporates nine articles and book reviews Dwight Murphey has written during the past decade that speak to "illusions" that prevail in American thought in three large subject areas: today's intolerant mental climate popularly referred to as "political correctness," mass migration, and the displacement crisis created by the global market. Some of these articles originally appeared in *The Journal of Social, Political and Economic Studies.*

Readers may find helpful a brief synopsis of each piece contained in the anthology:

"Political Correctness: Americans' Mental Incubus"

American society has in recent years, Murphey says, condoned an irascible intolerance that applies on a selective basis to certain sacrosanct areas within the dominant intellectual ideology. In the context of the ideology of "victimization," there are iron-clad taboos on discussion. These enforce a double standard not only in the articulation of ideas but within American law and institutions.

Murphey claims that although the American Left most frequently sees itself as social democratic and fully supportive of freedom of speech and of protest, the contemporary emphasis on "political correctness" is actually the third episode during which the American Left has revealed an underlying totalitarian temperament. The first of these was the 1920s-1930s adoration of "the great Soviet experiment," which demonstrated enthusiasm for one of the world's more brutal and despotic regimes. The second came in the late 1960s with the New Left's endorsement of Herbert Marcuse's theory of "repressive tolerance," which urged openness toward all views on the Left and suppression of all conservative views.

He says that the seeming incongruity between these episodes and

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the erstwhile social democratic emphasis can be understood if the dynamic factors that nourish the Left are kept in mind. The Left is primarily moved by the "alienation of the intellectual against bourgeois society," and the intelligentsia has long sought allies among the unassimilated and/or disaffected. This requires freedom to proselytize and to protest on behalf of those groups, requiring a commitment to free speech.

"Massive Immigration: The Genocide of a People and a Culture"

Murphey believes that the continuing demographic invasion of the United States and Europe during the past forty years by migrants from the Third World amounts, in effect, to an historically rapid forfeiture by Americans and Europeans of their cultural and national identities. This comes home strongly in a piece that is an article-length review of Wayne Lutton and John Tanton's *The Immigration Invasion*. Although Murphey recounts and critiques Lutton and Tanton's exposition of the many tangible effects of the immigration, his own contribution comes primarily in his discussion of the ideological and cultural intangibles. He says that "Lawrence Auster [in Auster's *The Path to National Suicide*] refers to what is perhaps the most important question: 'What is the impact of immigration on the whole society – on America as a *civilization*.'" To Murphey, "the naïve assumption that the United States is bound forever to remain a unified country is coming to have less and less foundation."

He is critical of the ideological position of those who "believe that America is defined solely by universal ideas." Murphey comes to the discussion from a lifetime of writing as a classical liberal, but he warns that "those in the classical liberal tradition need above all to cultivate an understanding of the many prerequisites both of civilization and of a free society." He believes that such classical liberal thinkers as Smith, Ricardo, Cobden, Bright and Bastiat "never envisioned a loss of European vitality. Their system of ideas presupposed, as a given about which they hardly found it necessary to speak, a certain civilizational order."

"Review of Patrick Buchanan's Death of the West*"*

This brief review of Buchanan's book serves as a capstone to the

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previous essay's discussion of immigration's threat to America and Europe. In his book, Buchanan enlarges the discussion to point to four factors that constitute "clear and present dangers" to peoples of European origin. These are the falling population among European peoples, increasing culture conflict promoted by migration, the on-going attacks on national sovereignty by both centrifugal and centripetal forces, and the existence of the "adversary culture" (which is the same thing Murphey speaks of when he refers to alienation). The result, according to Murphey, is that "Buchanan continues to write some of the most thoughtful and informative books appearing today on culture, ideology and policy."

"Race Relations in America"

In this review article, Murphey critiques Jared Taylor's important book *Paved With Good Intentions: The Failure of Race Relations in Contemporary America.* Although thinkers such as Jared Taylor, Lawrence Auster and Samuel Francis are identified as exemplifying "white bigotry," Murphey says that for such thinkers "bigotry has nothing to do with it." He points out that until recently, few would have had occasion to describe the mainstream of American society in racial terms as 'white' or as predominantly European in origin. "People valued the United States and its heritage for its own sake without thinking in those terms... What has caused the focus to change has not been that culturally-concerned classical liberals have adopted a 'racist' outlook, but that the mainstream civilization has come to be challenged... by a multiculturalist ideology than exalts other ethnicities and that has launched a virulently racial attack on the whiteness of the mainstream." He, however, sees no malevolence in these thinkers, and sees their defense of Euro-American civilization as both sound and courageous, even though he at the same time warns that white self-consciousness could, of course, become destructive.

With this discussion as prologue, he recounts the various aspects of Taylor's book, such as the rise of a black underclass, the changed direction of the Civil Rights Revolution from color-blind to increasingly race-conscious, and the policy of "affirmative action."

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"The Martin Luther King Myth"

Murphey describes the principal components of the myth that has come to surround Martin Luther King, Jr., and considers that myth troubling. He tells how the current image of King came to be adopted not by the freely-given acceptance of the American people as a whole, but by what he describes as a "mental conquest," since the image was coercively imposed on anyone who didn't accept it and is enforced today through the taboos on discussion that make up what is called "political correctness."

He asks, "Is the King myth based on the essential truth about the man and his actions?," and says that "this is where King's image truly runs aground." An examination of the falsity behind the myth takes Murphey into the detail of King's plagiarism (such as of his doctoral dissertation and his "I Have a Dream" speech), King's "serial adultery," his championing of revolutionary and Communist movements around the world, and the hypocrisy of his "nonviolence" even in the midst of burning cities.

Several pages of thoughtful discussion follow about "underlying issues that anyone who is reflecting on the myth will want to consider." Among these issues, Murphey introduces the question of whether American society took the most constructive approach to racial relations when it chose to force social change by direct-action activism and legislation. He praises, as an alternative to this, "the wisdom of those who saw that the slow growth of fraternity through mutual respect is far preferable, and much more likely to be permanently successful." The results of forced social change, he says, have been disastrous: "Sixty years after the beginnings of this shift, there is still a deep sense of victimization on the part of blacks, American society remains accused of racism."

"Conceptual Issues in Prohibiting 'Hate Speech'"

This article takes the reader back to the suffocating mental climate that prevails today. Here, he considers the varied definitions of "hate speech," and tells of the legislation and speech codes that prohibit it. Murphey tells how the concept has been used against serious scholarly endeavors, and not just (as those who accept the concept superficially

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might suppose) against "fighting words" and gratuitous slurs.

Most of the article analyzes the conceptual difficulties inherent in the "hate speech" category. The concept is profoundly naïve, he says, in its failure to see that much of the animosity felt in the world is not merely gratuitous, based on ill-informed racial and ethnic stereotypes, but instead stems from many sources, often quite legitimate. "Imagine having seen your mother or brother's arms hacked off by a machete. Would the rage against those who did that ever leave you?" Indeed, the world is made up of "conflicting ideologies, religions, myths, interests and cultures – all supported by a complex web of ideas." Murphey says "these teeming ideas are the very stuff from which the more important issues within human discourse are formed." He concludes that "to characterize large segments of that discourse as 'hate speech' is to attempt the impossible, baling water from the ocean."

"Reflections on Global Capitalism"

This is the first of the essays that has to do with the threat Murphey sees as impending to existing civilization from the displacing effects of the global economy. It is a book review article centered around William Greider's *One World, Ready or Not: The Manic Logic of Global Capitalism*. Both skilled and unskilled workers are being thrown into competition with low-cost Third World labor while technology makes labor itself less and less needed, and firms and industries are themselves being displaced. Multinational corporations are growing, national sovereignty is being undercut, and both wealth and income is becoming ever-more polarized.

Although Murphey sees much to fault in Greider's Marxist analysis, he adds that "it is important now for a supporter of a market economy to address the issues of polarization-of-income and purchasing-power-disparity," just as socialist thought has done (with far less justification) for well over a century. Murphey discusses briefly the concept, which he says will become increasingly desirable, of a "shared market economy," where a global market proceeds with fierce competitiveness while the population of advanced societies shares in the produce by each person's having an ownership stake in the economy as a whole. Almost everyone's future income, he says, will have to come far more from ownership

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than from work. This idea is discussed in detail in Murphey's book *The Emerging Crisis of Economic Displacement*, which appears on his web site at *www.dwightmurphey-collectedwritings.info*. He sees the impending economic displacement as much more serious than does almost any other free-market theorist.

"Boom and Displacement in a Global Economy"

This article, now appearing in the anthology, was based on one of the chapters in the book just mentioned. It appeared in 1999 and gave considerable detail about the displacement of workers and industry that had occurred up to that time. That detail has been superseded, of course, by countless more recent examples of offshore contracting, immigrant labor, etc. Murphey included it untouched, however, because he feels that the larger forces, not the particular details, are most important.

He points out that the Industrial Revolution caused a massive shift of labor from agriculture into industry. Then the move from manufacturing to services caused a comparable shift from industrial into service employment. Now, however, technology and low-wage global competition are removing much of the service work. The nostrum one hears from "free market" enthusiasts is that "people must retrain." Retrain for what?, Murphey asks. Even high-tech work is being exported, and over time it will become far less labor-intensive than it is today. Since people will always scratch for something to do if work is to be their source of income, the result will probably not be so much a measurable "unemployment" as it is chronic *under*employment and a growing polarization of income and wealth. The destruction of the middle class as the mainstay of a free society should, he says, be a major concern to those who look not just to a "free market" but more broadly to what it takes to nourish a "free society."

"A Critique of the Central Concepts of Free Trade Theory"

Murphey sees this essay as the one in which he makes perhaps the greatest personal contribution. All of the consternation over outsourcing and the ever-growing trade deficit means little, he thinks, unless the ideology of "free trade" is thought through in a much more nuanced way than it has been in the over-simplified ideology that today

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rules as the conventional wisdom.

He starts his critique of free trade theory by reviewing various criticisms that socialist thought has long made of the market economy, demonstrating why they are fallacious. These include the differing forms of "exploitation theory," the so-called "Berle and Means Thesis" that corporations are "irresponsible" because their leadership is not meaningfully accountable to stockholders, and the theory of underconsumption and overproduction.

He moves on from there, however, to analyze several "problem areas in free-market thinking." He believes that the "act of exchange," the basic building-block of market theory, has long been poorly understood, so that much has been omitted that needs to be taken into account in establishing the prerequisites for a truly workable market and a free society. Next, he takes on the economists' truism that "wages are tied to productivity," pointing out that that is true only when certain presently-unrealized assumptions are satisfied. From there, he sees a fundamental conceptual flaw in the ideological linchpin of free-market thinking, which is that a market produces "an optimum allocation of resources," so that any deviation from pure supply and demand will necessarily result in inefficiency and a loss of well-being. It is this fallacious concept, Murphey says, that locks the free-market theorist into an ideological circle that permits no considerations to intrude on what "the market" demands. The essay goes on to discuss several other ideas that are central to free-trade theory, and finds that thinkers who wish to protect a given nation's position, such as that of the United States, will find it desirable to allow themselves far broader policy options than *laissez-faire* thinking permits.

The surprising thing is that this critique comes from a man who for more than forty years has written from a classical liberal point of view. He is a charter member and former first vice president of the Philadelphia Society, and in the thinking reflected in these essays, he by no means sees himself as abandoning classical liberalism; instead, he believes it vital to refine that thinking in ways that are essential to its continuing to play a significant role.

Ian McNish

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The End of the American Era:
U.S. Foreign Policy and the Geopolitics
of the Twenty-first Century
Charles A. Kupchan
Alfred A. Knopf, 2003

This book provides insight into the thinking of one of today's more prominent American academicians in the field of international relations. Charles Kupchan is a professor of international relations at Georgetown University and a senior fellow at the Council on Foreign Relations. The fact that he served on the National Security Council during the first Clinton administration is relevant to understanding where he is positioned along the spectrum of international relations theorists. He favors a "liberal internationalism" that will strike what he considers a reasonable middle ground between what he describes as extremes of isolationism and internationalism.

The main thrust of the book is his point that America's "unipolar moment" won't last long. Competing power centers will arise in the world, the first of which will be Europe by virtue of its unification. He urges that U.S. policy makers seek to manage the transition in the most constructive way possible, using a multi-layered tier of international institutions to address the many issues that will arise. The intention will be to make the transition peaceful, minimizing the consequences of newly emerging geopolitical fault lines and retaining the best features of the international order the United States has constructed. Perhaps his most striking suggestion is that, in effect, Franklin Roosevelt's 1940's vision of a benign direction of world affairs by a consortium of the major powers should be resurrected. A "directorate of major states," having as its founding members the "United States, the European Union, Russia, China and Japan" and supplemented by "major states from other regions," would function "along the lines of the Concert of Europe" that followed the Napoleonic Wars. "Like the Concert, this directorate would serve as an informal forum for discussion and coordination. Decisions would be reached through consensus...." In FDR's case, this vision fell apart almost instantly as his (and later Truman's) premise that Stalin was a good fellow proved false. Kupchan's implied premise is that

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the major powers will at least fundamentally have common interests that will allow such coordination.

Kupchan would avoid a form of internationalism that he sees as extreme. In its place, he speaks of "strategic restraint – selectively and prudently applied – [as] the core logic that should inform an American grand strategy." He refers to "a new and more discriminating brand of liberal internationalism." When he mentions democracy, he speaks of "advancing" it rather than crusading to impose it. He would also steer clear of the other pole: he would have the United States avoid its impulse toward unilateralism; and he describes (and opposes) a "populist" foreign policy that would be geared toward protecting traditional American values domestically and would, to keep from inviting hatreds, use American power sparingly.

It would add considerably to the book's intellectual contribution if Kupchan showed an awareness of and gave reasons to reject the specific forms that each of his "extremes" are taking. While he mentions "neoconservatives" and their role in the George W. Bush administration, there is no mention of "The Project for a New American Century," perhaps the chief manifesto of the neoconservatives. He makes no detailed discussion of their proposals for a *Pax Americana* and for resisting the rise of competing power-centers. Nor, at the other end, so far as the "populist" view he cites is concerned, does he show awareness of Patrick Buchanan's *A Republic, Not an Empire*. (Buchanan's name doesn't even appear in the index.) Buchanan advocates an "enlightened nationalism," and argues that it is both dangerous and presumptuous for the United States to be the world's policeman and social worker. Because Kupchan is unaware of the leading expositions of the views he opposes, a reader receives the impression that his discussion is poorly informed and less than intellectually compelling.

Perhaps this is not so much avoidance as it is the ignorance that is induced by encapsulation within a given academic hive or intellectual orthodoxy. It suggests the unfortunate possibility that some important scholars in international relations are intellectually insular. One way this appears is in Kupchan's description of himself as a member of the "realist" school, which sees "centers of power" as of chief importance in international affairs. "Geopolitical rivalry... Great powers" are central.

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It is the "distribution of power, not democracy, culture, globalization, or anything else," Kupchan says, that is "the defining element of the global system." (We should note that he does broaden this considerably when he adds that the concern about power should be tempered by "idealism," which brings in "reason, law, values, and institutions.")

This reviewer has not made a systematic study of the "realist" school, but the many times he has come upon it has left him with a strong impression that it often suffers from severe reductionism. It is commonplace to point out that in the study of history and of society, thinkers used to preoccupy themselves with what was happening at the top of society among kings and aristocracies. One of the effects of an empirical age has been to shift the emphasis to a study of the less flashy but immensely important underlying forces, such as demographic, cultural and technological factors, that provide the historic wave upon which kings are mere bubbles. This was the central point Leo Tolstoy made in *War and Peace*. It seems oddly atavistic, then, for the "realist" school to focus so exclusively on "great powers," as though political power does not rest on the ever-changing sands of culture, technology, ethnicity, affluence, ideology, etc.

This reductionism is brought home most graphically by the fact that Kupchan's analysis ignores so much. He hopes his book to be a meaningful review of the world situation now and in the foreseeable future. But he takes no account of many forces that loom large in affecting that future. Here are some he would do well to explore:

- *The rapidly advancing demographic conquest of Euro-American civilization by the migrating peoples entering it from Asia, Africa and Latin America.* Kupchan's insularity toward Buchanan has a second aspect: that he seems unaware of the phenomenon described so vividly in Buchanan's book The *Death of the West*. There is a brief mention of a possible American balkanization toward the end of Kupchan's book, but with almost no sense of what that balkanization implies or of the massive demographic shifts that are bringing it about. One of Kupchan's main points is that a unified Europe is about to emerge as a contending power in what will then be a multipolar – no longer a unipolar – world. Then both Europe and the United States will be superpowers. This is necessarily premised on the supposition that "Europe" and "the United

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States" are solid things, having a certain reality. But that supposition seems questionable when the population of both is in rapid transition, with a Third World population growing within each that will replace the existing civilization with another.

Such developments not only undermine the "realist" theory of "centers of power" by putting its core concept into doubt, but are important for their own sake in any analysis of world events.

A similar point can be made about Kupchan's speculation, in a futuristic final chapter that doesn't seem fully congruent with the rest of his book, that industrial capitalism, liberal democracy and the nation-state may be replaced by "digital capitalism" and institutions yet unknown. Again, we see entities referred to as existing when their essence will have changed.

- *The hollowing-out of the American economy as the United States loses its manufacturing base and productive assets.* It is hard to imagine a discussion of the near- and long-term power structure of the world without coming to grips with the spectacular dissipation of American assets that is occurring through the United States' decades-long, and still growing, trade imbalance. What sort of a "power center" *will* the United States be after that proceeds much longer?

- *The dominant role within the United States and the "international community" of what Samuel Huntington has called "the Davos elite."* The hegemonic control over "respectable" opinion by an elite that determines what is "politically correct" within European and American society and among the movers and shakers on the world scene is, again, a fact of profound significance. One can argue that the "centers of power" are themselves at the beck and call of that elite and its all-pervasive atmosphere of opinion.

- *The fact that the world is hardly "unipolar" at a time when the United States is severely tested by asymmetrical forces that pose dangers comparable to or that even exceed what any established "center of power" would threaten.* After September 11, it seems quixotic to think of the United States as "the one remaining superpower." It is much like speaking of Gulliver as "the one remaining giant" at the very time the Lilliputians are busily tying him down.

Speaking broadly, it can be noted that asymmetrical warfare has

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been around for many generations and has long challenged existing power-centers. Nechayev and his fellow nihilists, say, made it ludicrous for "realists" of the nineteenth century to speak of the omnipotence of the Tsars' power. More specifically in today's world, Islamicist passion is a force of major proportions, even though it exists within vast populations and has no one geographic or political center.

- *The fact that the Arab-Israeli conflict is not just another item "to be fixed," but is a cancer fundamental to the existing hatreds.* Kupchan does prescribe, though cursorily, that the United States should seek a peaceful solution to the Israeli-Palestinian conundrum, but he hardly sees that conflict as central to the terrorist challenge to the United States. He posits that Islamism results from problems within Islam itself, most particularly from the mortification Muslims feel over Islam's loss of centrality and over their feeling that they are falling even further behind.

What he says is assuredly part of the truth. It comports with the view taken by the scholar Bernard Lewis, who has studied Islamic societies at length. The rest of the truth, however, was voiced as long ago as 1947 (and even well before that) when it was pointed out by astute observers that the establishment of the state of Israel *without first obtaining the good graces of its Arab neighbors* would invite perpetual war. No prediction has ever proved more accurate. The solution cannot be to go back and undo the formation of Israel – but the need for a settlement acceptable to both sides is far more imperative than Kupchan makes it seem.

- *The fact that significant dangers do* indeed *stem from the United States' presuming to be the policeman and social worker of the world.* Kupchan cites this concern, but dismisses it without much discussion. It is part of what he sees as a long-superseded view stemming from the United States' earlier isolationism. Kupchan acknowledges that the United States has been "unabashedly using globalization to remake the world in its image." He also acknowledges Third World anger over the impacts of globalization. What he misses is a full comprehension of just how passionately many peoples are bound to feel toward preserving their own ways of life. It is strange that he gives this minor significance, since in another context he interprets the United States' intervention

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against Germany in World War I as an opposition to "German domination over Europe." Presumably, German "domination" was an evil worthy of being resisted at great cost. But he doesn't extend this insight to see the same thing about American domination over cultures that don't want to be dominated. Because of this selective perception, he denies that an American hegemony is a potent stimulus for danger to the United States.

There is much else that Kupchan does not take into account. The list could be supplemented, too, by examples of shallowness as he accepts many dubious points in the prevailing conventional wisdom. But before we conclude, it is important to shift to one additional subject. The vastness of the commitments he would have the United States undertake – even as he calls for "strategic restraint" – deserves attention. Those commitments are so open-ended that one wonders what exactly is "restrained" about them. They are, of course, in line with the premise of world-meliorism that guides the Davos culture. Here are some of the things he would have the United States do:

- That the United States should play a role in virtually every global "trouble spot," although not necessarily sending in troops. Kupchan speaks of "the country's role as the globe's strategic guardian." An example of the second Bush administration's "isolationist instincts," he says, is the fact that Secretary of State Colin Powell dropped "more than one-third of the fifty-five special envoys that the Clinton administration had appointed to deal with trouble spots around the world." The United States should "develop alternative sources for prevention and intervention" into such "ethnic and civil wars" as have occurred in "Bosnia, Serbia, Azerbaijan, Rwanda, and East Timor." "If the United States loses interest in being the sheriff, there would be no one to form the posse."
- That the United States has "strong reasons" to "ensure the security of Israel." He mitigates this by wanting the United States to push for a peace settlement between the Israelis and Palestinians. (The mitigation, however, is weakened when he doesn't say how this is to be accomplished .)
- That the United States should continue to provide the "protective umbrella" that will help preserve a "stable balance" in East Asia.

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This is, of course, much broader than just continuing to serve as a shield for Taiwan, which he includes within it.

- That the Unites States should develop a long-term plan gradually to remold the "developing world," including aiming "at political liberalization, the growth of a middle class, the improvement of educational opportunities, and the modernization of social institutions." Particularly, it should promote "development among the impoverished nations of Africa and South Asia."
- That "the United States and other wealthy countries should eliminate remaining commercial barriers with the developing nations" (without regard to the fact that the U.S. is already allowing entry to massive quantities of imports and running an unprecedented trade deficit).
- That the United States "should increase the use of enterprise funds – publicly supported investment funds –..." to "support the growth of small business" in the developing countries.
- That the United States should make itself a party to the Kyoto Treaty on global warming (despite questions about its scientific rationale and the vastly unequal burdens it imposes as between, say, the United States and China), the treaty to outlaw landmines (without considering the importance of landmines to the United States in defending South Korea), and the international criminal court (without regard to the threat this would pose to American leaders precisely as they pursue the role Kupchan favors of being policemen to the world).

All of this is not trumpeted as vigorously as the neoconservatives do. But it is based on two premises which every serious student of international affairs must seriously question rather than implicitly embrace: that the resources of the United States (and of the American taxpayer) for public expenditure are virtually without limit; and that the needs of the world's billions of other people do not constitute in effect a "bottomless pit" that can consume philanthropy infinitely with little discernible effect. Only if these premises are examined will the discussion move from fantasy to reality. It would be fitting if a school of thought that calls itself "realist" would undertake that.

Dwight D. Murphey

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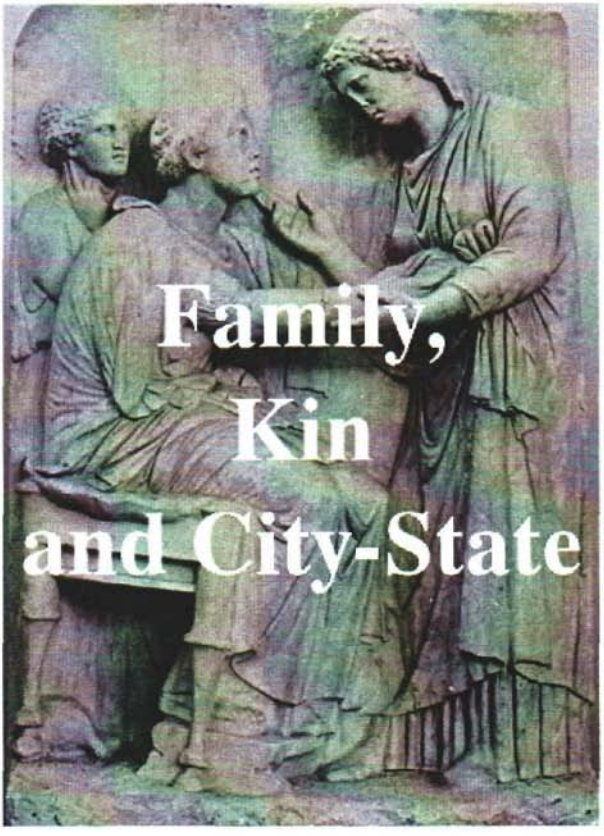
Numa Denis Fustel de Coulanges



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